(1)
97 . 230 AUG 6 1997
No. 97-
OFFICE OF THE CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1997

GENERAL ELECTRIC COMPANY, and
DRUCKER & GENUTH, MDs, P.C., d/b/a
SOUTH SHORE IMAGING ASSOCIATES,
Petitioners,

v.

FONAR CORPORATION and
DR. RAYMOND V. DAMADIAN,
Respondents.

Petition for a Writ of Certiorari to the United States Court of Appeals for the Federal Circuit

PETITION FOR A WRIT OF CERTIORARI

BENJAMIN W. HEINEMAN, JR.
BRACKETT B. DENNISTON, III
ERWIN F. BERRIER, JR.
MOLLY B. BURKE
GENERAL ELECTRIC COMPANY
3135 Easton Turnpike
Fairfield, CT 06431
(203) 373-2211

CARTER G. PHILLIPS *
MARK E. HADDAD
JOSEPH R. GUERRA
SIDLEY & AUSTIN
1722 Eye Street, N.W.
Washington, D.C. 20006
(202) 736-8000

DONALD R. DUNNER
THOMAS H. JENKINS
J. MICHAEL JAKES
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.
1300 I Street, N.W.
Washington, D.C. 20005
(202) 408-4000

Counsel for Petitioners

* Counsel of Record

August 6, 1997

WILSON - EPES PRINTING CO., INC. - 789-0096 - WASHINGTON, D.C. 20001

108 pp

QUESTIONS PRESENTED

In *Manufacturing Co.* v. *Cowing*, 105 U.S. 253, 256 (1881), and in a long line of subsequent cases, this Court has held that, in cases involving a patented improvement to a preexisting machine, damages could not be measured on the basis of the value of the machine as a whole unless "no . . . sales would have been effected" without the improvement. The first question presented is:

1. Whether the court of appeals was faithful to *Cowing* and its progeny by permitting recovery of tens of millions of dollars based on the entire value of a machine for infringement of an improvement patent relying solely on proof that the patented feature is mentioned in marketing materials used to sell the entire machine.

Last Term this Court in *Warner-Jenkinson Co.* v. *Hilton-Davis Chemical Co.*, 117 S. Ct. 1040 (1997), admonished the Federal Circuit to adopt "procedural improvements" to promote "certainty, consistency and reviewability" under the doctrine of equivalents in patent law. The second question presented is:

2. Whether the court of appeals' refusal to apply the procedural requirement of "particularized testimony and linking argument" as an integral component of the doctrine of equivalents violated the mandate of *Hilton-Davis*.

PARTIES TO THE PROCEEDINGS

All of the parties in this case are listed in the caption.

Pursuant to Rule 29.6 of the Rules of this Court, petitioners state that they have no parent companies and no non-wholly owned subsidiaries.

TABLE OF CONTENTS

	Page
QUESTIONS PRESENTED	i
PARTIES TO THE PROCEEDINGS	ii
TABLE OF AUTHORITIES	iv
OPINIONS BELOW	1
JURISDICTION	1
STATUTORY PROVISIONS INVOLVED	2
STATEMENT	2
REASONS FOR GRANTING THE PETITION	9
CONCLUSION	21

TABLE OF AUTHORITIES

CASES — Page

Armstrong v. *Belding Bros. & Co.*, 297 F. 728 (2d Cir. 1924) 11
Crosby Steam-Gage & Valve Co. v. *Consolidated Safety-Valve Co.*, 141 U.S. 441 (1891) 3, 10, 14
Dobson v. *Hartford Carpet Co.*, 114 U.S. 439 (1885) 10, 11
Electric Pipe Line, Inc. v. *Fluid Sys., Inc.*, 250 F.2d 697 (2d Cir. 1957) 11, 14
Festo Corp. v. *SMC Corp.*, 72 F.3d 857 (Fed. Cir. 1995), *vacated and remanded*, 117 S. Ct. 1240 (1997) 20
Fonar Corp. v. *Johnson & Johnson*, 630 F. Supp. 581 (D. Mass. 1986), *aff'd*, 821 F.2d 627 (Fed. Cir. 1987) 7
Fonar Corp. v. *Johnson & Johnson*, 821 F.2d 627 (Fed. Cir. 1987) 7, 9
Garretson v. *Clark*, 111 U.S. 120 (1884) 10
Hughes Tool Co. v. *G.W. Murphy Indus., Inc.*, 491 F.2d 923 (5th Cir. 1973) 11
Hurlbut v. *Schillinger*, 130 U.S. 456 (1889) 10
Kalman v. *Berlyn Corp.*, 914 F.2d 1473 (Fed. Cir. 1990) 12
King Instrument Corp. v. *Perego*, 72 F.3d 855 (Fed. Cir. 1995), *cert. denied*, 116 S. Ct. 1675 (1996) 17
Lear Siegler, Inc. v. *Sealy Mattress Co.*, 873 F.2d 1422 (Fed. Cir. 1989) 4, 18
Litton Sys., Inc. v. *Honeywell, Inc.*, 87 F.3d 1559 (Fed. Cir. 1996), *vacated and remanded*, 117 S. Ct. 1240 (1997) 20
Malta v. *Schulmerich Carillons, Inc.*, 952 F.2d 1320 (Fed. Cir. 1991) 18
Manufacturing Co. v. *Cowing*, 105 U.S. 253 (1881) ..... i, 3, 10, 14
Marconi Wireless Tel. Co. of America v. *United States*, 99 Ct. Cl. 1 (1942), *aff'd in part*, 320 U.S. 1 (1943) 11, 14
Markman v. *Westview Instruments, Inc.*, 116 S. Ct. 1384 (1996) 3, 17

TABLE OF AUTHORITIES—Continued

	Page
Mowry v. *Whitney*, 81 U.S. (14 Wall.) 620 (1871)	11
National Presto Indus. v. *West Bend Co.*, 76 F.3d 1185 (Fed. Cir. 1996)	4, 18
National Rejectors v. *A.B.T. Mfg. Co.*, 188 F.2d 706 (7th Cir. 1951)	11
Nestier Corp. v. *Menasha Corp.-Lewisystems Div.*, 739 F.2d 1576 (Fed. Cir. 1984)	18
Paper Converting Machine Co. v. *Magna-Graphics, Corp.*, 745 F.2d 11 (Fed. Cir. 1984)	12
Rite-Hite Corp. v. *Kelley Co.*, 56 F.3d 1538 (Fed. Cir.), *cert. denied*, 116 S. Ct. 184 (1995)	12, 13
Seymour v. *McCormick*, 57 U.S. (16 How.) 480 (1853)	15
Texas Instruments, Inc. v. *Cypress Semiconductor Corp.*, 90 F.3d 1558 (Fed. Cir. 1996), *cert. denied*, 117 S. Ct. 1818 (1997)	18
Warner-Jenkinson Co. v. *Hilton-Davis Chem. Co.*, 117 S. Ct. 1040 (1997)	*passim*

STATUTES

28 U.S.C. § 1254(1)	2
35 U.S.C. § 112	2
§ 271	2
§ 284	2

OTHER AUTHORITIES

Robert J. Cox, *Recent Development: But How Far?: Rite-Hite Corp.* v. *Kelley Co.'s Expansion of the Scope of Patent Damages*, 3 J. Intell. Prop. 327 (1996)	13
Julie L. Davis, *Patents Infringement Damage Awards 1982-1994*, Licensing Law and Business Report, May-June 1995, Vol. 17, No. 7 (Clark Boardman Callaghan)	16
Robert F. Hartley, *Marketing Successes: Historical to Present Day: What We Can Learn* (1996)	16
Intellectual Property Damages: An Analysis of Patent Damage Awards 1982-June 1996 (Arthur Andersen LLP 1996)	16

TABLE OF AUTHORITIES—Continued

Page

Karen D. McDaniel & Gregory M. Ansems, *Damages in the Post-Rite-Hite Era: Convoyed Sales Illustrate the Dichotomy in Current Damages Law*, 78 J. Pat. & Trademark Off. Soc'y 461 (1996) 13

Paul R. Michel, *The Challenge Ahead: Increasing Predictability in Federal Circuit Jurisprudence for the New Century*, 41 Am. U.L. Rev. 1231 (1994) 10

William M. Pride & O.C. Ferrell, *Marketing: Basic Concepts and Decisions* (4th ed. 1985) 15

Brent Rabowsky, *Recovery of Lost Profits on Unpatented Products in Patent Infringement Cases*, 70 S. Cal. L. Rev. 281 (1996) 13

Wendell R. Smith, *Product Differentiation and Market Segmentation as Alternative Marketing Strategies*, 21 J. Mktg. 8 (1956), *reprinted in Managerial Marketing: Perspectives and Viewpoints* 203 (Eugene J. Kelley & William Lazer, eds. 1967) 15

IN THE

Supreme Court of the United States

OCTOBER TERM, 1997

No. 97- ——

GENERAL ELECTRIC COMPANY, and
DRUCKER & GENUTH, MDs, P.C., d/b/a
SOUTH SHORE IMAGING ASSOCIATES,
Petitioners,

v.

FONAR CORPORATION and
DR. RAYMOND V. DAMADIAN,
Respondents.

Petition for a Writ of Certiorari to the United States Court of Appeals for the Federal Circuit

---

PETITION FOR A WRIT OF CERTIORARI

Petitioners General Electric Company and Drucker & Genuth, MDs, P.C. (collectively "GE"), hereby petition for a writ of certiorari to review the judgment and opinion of the United States Court of Appeals for the Federal Circuit in this case.

OPINIONS BELOW

The opinion of the court of appeals (Pet. App. 1a-23a) is reported at 107 F.3d 1543. The district court's opinion (Pet. App. 24a-78a) is not reported.

JURISDICTION

The court of appeals entered judgment on February 25, 1997. Pet. App. 1a. GE's timely petition for rehearing

and its suggestion of rehearing *en banc* were denied on May 8, 1997. Pet. App. 79a. The jurisdiction of this Court is invoked under 28 U.S.C. § 1254(1).

STATUTORY PROVISIONS INVOLVED

35 U.S.C. § 112 provides in pertinent part:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it. . . .
>
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

35 U.S.C. § 271 provides in pertinent part:

> (a) Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.

35 U.S.C. § 284 provides in pertinent part:

> Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court.

STATEMENT

The pace of technological change and the competition over technology by companies worldwide has increased dramatically in the past decade. A disturbing companion trend has been the dramatic increase in both the amount of patent litigation and the size of jury verdicts awarded in those cases. See page 16, *infra*. Because the stakes in patent litigation can be enormous, any rule of law that significantly affects either potential liability or the proper

damages to be awarded profoundly affects the litigation process and alters significantly the incentives of the parties to settle. These developments have prompted this Court to decide two landmark patent cases in the past two Terms. See *Markman* v. *Westview Instruments, Inc.*, 116 S. Ct. 1384 (1996); *Warner-Jenkinson Co.* v. *Hilton-Davis Chem. Co.*, 117 S. Ct. 1040 (1997).

This case follows squarely in the tradition of *Markman* and *Hilton-Davis* by providing the Court with a timely and effective vehicle for providing vital legal guidance to our national system for resolving intellectual property disputes. First, this Court should address the critical issue of damages in patent litigation by determining whether the "entire market value" rule of patent damages can be manipulated, contrary to this Court's prior holdings, to permit mere improvements in a complex, multi-patented device to generate damage awards of tens of millions of dollars based solely on proof that the seller of the device made reference to the improvement in its marketing materials and without regard to any evidence of how consumers actually responded to the particular improvement.

This Court long ago established that the "entire market value rule" allows recovery based on the value of the entire service to which a patented improvement relates but that this rule applies only in exceptional cases where machines *without* the patented improvement are commercially worthless and cannot be sold. *Manufacturing Co.* v. *Cowing*, 105 U.S. 253, 256 (1881). See *Crosby Steam-Gage & Valve Co.* v. *Consolidated Safety-Valve Co.*, 141 U.S. 441, 453 (1891). The Court explained that the rule simply does not apply when a patented improvement provides only an "advantage in . . . marketability"; rather, if a machine lacking the improvement is salable, the value of any marketing advantage derived from the patent is the limit of the patentee's recovery. *Cowing*, 105 U.S. at 255. In sustaining the verdict below, however, the Federal Circuit held that a mere marketing advantage, which is all that the promotional materials relied upon by

the Court can prove, provided the basis for *applying* the entire market value rule. This decision, which is the culmination of a series of rulings that severed the entire market value rule from its doctrinal moorings as established by this Court, will further fuel the uncertainty and unpredictability in patent damages awards. Every patented improvement, no matter how relatively insignificant, of an expensive product will generate a significant claim for damages, which will harmfully distort the prospects for settlement. The stark conflict between this Court's precedents and the rulings of the Federal Circuit warrants review by this Court.

Second, last Term this Court recognized in *Hilton-Davis* that proving patent infringement by "equivalents" rather than literally must be carefully controlled by the lower courts, and particularly by the Federal Circuit. In prior decisions the Federal Circuit had adopted the requirement of "particularized testimony and linking argument" as a critical element of the doctrine of equivalents. *Lear Siegler, Inc.* v. *Sealy Mattress Co.*, 873 F.2d 1422, 1426 (Fed. Cir. 1989). It is not enough for the patent plaintiff to introduce evidence from which a jury could conclude that the accused device is equivalent to the patented device. The plaintiff has the further burden of offering particularized testimony as to precisely how the accused device, when it does not literally infringe a particular element of the patent, nevertheless performs a similar function in a similar way to produce a similar result. In addition, plaintiff in closing must explain to the jury its theory of equivalents by identifying specifically which claim elements it relies upon as equivalent, and most important, explain to the jury how the two devices are equivalent with respect to those elements.

In the wake of *Hilton-Davis*, the need for this "particularized testimony and linking argument" is, if anything, absolutely critical. Nevertheless, a panel of the court of appeals expressly abandoned the requirement in 1996 in *National Presto Indus.* v. *West Bend Co.*, 76 F.3d 1185

(Fed. Cir. 1996), and another panel in this case simply refused to apply the rule of *Lear Siegler*. The decision is thus completely at variance with the critical element of *Hilton-Davis* urging that limitations be placed on use of the doctrine of equivalents.

The lower court's willingness to uphold an infringement verdict under the doctrine of equivalents in these extraordinary circumstances simply confirms this Court's observation that the judicially created "doctrine of equivalents, as it has come to be applied since [the Court's 1950 decision in] *Graver Tank*, has taken on a life of its own." *Warner-Jenkinson Co.* v. *Hilton-Davis Chemical Co.*, 117 S. Ct. 1040, 1048-49 (1997). More fundamentally, the decision below vividly illustrates the critical need for this Court to cabin and limit a doctrine of its own creation, and provides the Court with a vital opportunity to mandate particularized testimony and linking argument as a "procedural improvement[] to promote certainty, consistency and reviewability." *Id.* at 1053 n.8.

1. This case arises out of a patent infringement dispute concerning GE's magnetic resonance imaging ("MRI") machines, which are medical diagnostic devices that produce images in white, black and gray of human body tissue. In its decision below, the Federal Circuit affirmed the jury's award of over $68 million for GE's infringement of Fonar Corporation's ("Fonar") United States Patent No. 4,871,966 (the "'966 patent"). The '966 patent claims one particular method and apparatus for obtaining, during a single MRI scan, multiple images at angles that are oblique, or not parallel, to each other. In its appeal, GE argued that the jury's award of nearly $62 million for royalties and lost profits should be reversed because the premise of the award was that the entire market value of GE's MRI scanners derived solely from the optional feature of multi-angle oblique imaging ("MAO"). GE argued that, as a matter of law, this premise could not be sustained under the principles this Court has announced

governing the entire market value rule because, as common sense and numerous undisputed facts in the record make clear, GE's MRI scanners have substantial value wholly apart from the MAO feature. Thus, for three years prior to the infringement period, a GE scanner without a multi-angle oblique feature dramatically outsold Fonar's competing scanner, which contained the MAO feature, by 268 to 44 (C.A. App. A5103-06). Moreover, in its own marketing brochures, Fonar relegated MAO to 39th place on a list of 52 notable features of its system (C.A. App. A5207; *id.* at A7126-32).

The court of appeals rejected GE's claim and held that, "[u]nder the entire market value rule, it was not improper for the jury to base a reasonable royalty on the value of the entire accused MRI machines." App. 15a. In so ruling, the court relied upon one GE technical brochure, which "highlighted MAO in 1987" and noted that several other brochures "identified the MAO." *Id.* According to the court, these brochures, by themselves, provided sufficient support for a jury determination that MAO creates the entire market value of all of GE's MRIs, and thereby exposed GE to tens of millions of dollars in damages. *Id.*

2. Fonar is also the exclusive licensee of United States Patent No. 3,789,932 (the "'832 patent"). Issued before the development of MRI technology, the '832 patent claims a three-step method for detecting cancer. The three steps consist of (a) obtaining numerical measurements, known as "standard" relaxation times or "T_1" and "T_2," for normal and cancerous tissues of a particular type [1]; (b) measuring the relaxation times of suspect tissue;

---

[1] T_1 and T_2 refer to the amounts of time it takes for the nuclei of atoms in body tissue to return to their natural state after they have been excited through exposure to a magnetic field and a radio frequency. Also known as "rates of relaxation," T_1 refers to the rate at which excited nuclei return to their natural low-energy state; T_2 refers to the rate at which spinning nuclei get out of phase with each other. Although a detailed understanding of the science of MRI is unnecessary to resolve any of the legal issues

and (c) comparing that measurement with the "standard" relaxation times obtained in step (a).

Over a decade ago, a different panel of the Federal Circuit affirmed a thoroughly reasoned decision rejecting Fonar's contention that the MRI technology, which produces images of human tissue, "is, or is equivalent to, comparing the measured T_1 and T_2 values of suspected tissue with standard values in order to detect cancer." *Fonar Corp.* v. *Johnson & Johnson,* 630 F. Supp. 581, 586 (D. Mass. 1986), *aff'd,* 821 F.2d 627 (Fed. Cir. 1987). In *Johnson & Johnson,* the district court overturned a jury verdict, concluding that the method of the '832 patent "cannot reasonably be read as a forecast of . . . imaging" and could not be construed to cover a process "*to produce images.*" *Id.* at 587 (emphasis added). The Federal Circuit affirmed this judgment, observing that the '832 patent "contains no reference whatever to 'imaging' or 'images.'" 821 F.2d at 632. In light of *Johnson & Johnson,* GE developed and marketed the leading brand of MRI machine in the world, confident that its imaging device did not infringe a patent that does not reference imaging.

Undeterred, Fonar revised its infringement theory, sued GE and convinced a second jury (that deliberated for a scant two hours) that MRI scanners infringe the '832 patent. Fonar's proof at trial was that the comparison step occurs when a physician looks at an image and is able to compare the brightness of suspect tissue against the brightness of surrounding tissue. C.A. App. A3239. Like the district court in *Johnson & Johnson,* however, the district court below set aside the jury's verdict, rejecting Fonar's new theory of infringement as "a valiant effort to fit a different square peg into the same round hole." App. at 35a. The court held that the patent requires a

---

raised by the decision below, a more complete explanation of the technology is set forth in the opinion of the district court. *See* App. at 25a-28a.

comparison of measurements of suspected tissue against *standards* previously established for normal and cancerous tissues, *not* a comparison of images of adjacent tissues. *Id.* at 34a. It therefore found that "the properly construed claims [do] not read on imaging as performed by GE's scanners." *Id.* at 35a n.4.

In its opening brief on appeal, Fonar persisted in its theory that a visual comparison of the brightness of adjacent tissues is the substantial equivalent of the comparison step recited in the patent. See Fonar Br. at 47 ("the viewer of the image makes an optical comparison measurement of the brightness of the tumor . . . with the brightness of the . . . surrounding tissue"). In its reply brief, however, Fonar advanced an entirely new theory. It argued that the comparison step occurs before any images are created, when the "signal strength" for suspect tissue is matched to a pre-calibrated value by the scanner. Under this new theory, the comparison takes place "before the visualization" of the image by a physician (Fonar Reply Br. 9, 13, 22-23)—not, as Fonar had previously argued, when the "viewer" compares the relative brightness of adjacent tissues in an image. Fonar Br. at 47.

The court below adopted this post hoc theory wholesale. See App. at 22a (comparison step performed equivalently when the "signal strength" of suspect tissue "was matched to a value within the pre-calibrated gray scale values"). In concluding that "the jury's verdict finding of infringement under the doctrine of equivalents was supported by substantial evidence" (*id.* at 21a), the court of appeals declined to address GE's argument that the jury had not heard any testimony or linking argument on equivalents.[2] Similarly, the court made no effort to

---

[2] Dr. Damadian's only discussion of "calibrating" standards, in which he likened the process to use of a "tuning fork," concerned step (b) of the claim—the measuring of T_1 and T_2; he never described the comparison step as the court below did. (C.A. App. A3234-39). Similarly, in closing argument, Fonar never claimed that the comparison step occurred inside the scanner before the viewer saw the image.

reconcile its holding that the '832 patent "concerns a technique for using NMR imaging to detect cancer" (App. at 3a) with its prior recognition in *Johnson & Johnson* that the '832 patent "contains no reference whatever to 'imaging' or 'images.' " 821 F.2d at 632.

REASONS FOR GRANTING THE PETITION

In the decision below, the Federal Circuit rendered two extraordinary rulings, each of which warrants review by this Court. The opinion below confirms the Federal Circuit's abandonment of the entire market value rule developed by this Court, and the lower court's adoption of a new rule that parades under the same name but is in fact antithetical to this Court's principles. Moreover, in restating the jury's infringement verdict under the '832 patent, the lower court made no effort to ensure that a jury verdict based on the doctrine of equivalents was the product of the procedural and substantive safeguards that this Court called for in *Hilton-Davis,* which was decided a week after the opinion was released in this case.

1. The lower court's mistaken application of the entire market value rule to sustain a damages award of $68 million is irreconcilably inconsistent with the standard this Court developed and applied in numerous decisions to govern recovery for infringement of improvement patents. The lower court's error, moreover, was not abberrational. Rather, it is the culmination of a series of decisions in which the Federal Circuit has converted a once-stringent limitation on damage awards into a lever that owners of improvement patents can use to capture revenues that are in no way attributable to their inventions. Unless corrected by this Court, the lower court's evisceration of the entire market value rule will further fuel the unprecedented uncertainty and growth of patent infringement awards. As Judge Michel of the Federal Circuit has observed, "huge damages" in patent infringement cases can result, at least in part, "because of the entire market

value rule," and these awards cannot help but deter the business community from introducing new products. See Paul R. Michel, *The Challenge Ahead: Increasing Predictability in Federal Circuit Jurisprudence for the New Century,* 41 Am. U.L. Rev. 1231, 1242 (1994).

This Court long ago ruled that, "[w]hen a patent is for an improvement, and not for an entirely new machine or contrivance, the patentee must show in what particulars his improvement has added to the usefulness of the machine." *Garretson v. Clark,* 111 U.S. 120, 121 (1884). In such cases, a patentee may recover damages "calculated on the whole machine" *only* where the patentee can "show, by . . . reliable and satisfactory evidence, . . . that the *entire value of the whole machine,* as a marketable article, is properly and legally *attributable to the patented feature.*" *Id.* (emphases added). The Court made clear that "case[s] falling within the . . . rule . . . [are] exceptional." *Dobson* v. *Hartford Carpet Co.,* 114 U.S. 439, 445 (1885).

Accordingly, the "entire market value rule" applies only where, without the improvement, "*no* . . . sales would have been effected" (*Manufacturing Co.* v. *Cowing,* 105 U.S. 253, 256 (1881) (emphasis added)) because a machine lacking the improvement is commercially *"worthless." Crosby Steam-Gage & Valve Co.* v. *Consolidated Safety-Valve Co.,* 141 U.S. 441, 453 (1891) (emphasis added).[3] The rule does not apply where a machine lacking the improvement is "valuable in the market, and salable," even if the addition of the improvement to such a machine provides an "advantage in cost, . . . in convenience of operation or *marketability.*" *Cowing,* 105 U.S. at 255 (emphasis added). Rather, in such cases,

---

[3] *See also Hurlbut* v. *Schillinger,* 130 U.S. 456, 472 (1889) ("defendant's concrete flagging derived its entire value from the use of the plaintiff's invention" because, if the concrete "had not been laid [in accordance with the improvement patent] it would not have been laid at all").

"[t]hat advantage is the measure of" damages. *Mowry* v. *Whitney*, 81 U.S. (14 Wall.) 620, 651 (1871). See also *Dobson*, 114 U.S. at 445 (damages based on product's entire market value are unavailable where the patented improvement provides only a "motive for purchasing the article containing it").

For over a century, appellate courts adhered to this Court's stringent standard, explaining that, in the case of improvement patents, damages may be calculated on an entire machine only where the improvement is "of such paramount importance that it substantially created the value" of the remainder of the machine (*Marconi Wireless Tel. Co. of America* v. *United States*, 99 Ct. Cl. 1, 49 (1942), *aff'd in part*, 320 U.S. 1 (1943)), and thus "gives the [machine] its *entire* commercial value." *Hughes Tool Co.* v. *G.W. Murphy Indus., Inc.*, 491 F.2d 923, 928 (5th Cir. 1973) (emphasis added). The courts emphasized that the rule was reserved for "rare cases" where, "but for the features found to have infringed[,] there would have been absolutely no sale" of the machine. *National Rejectors* v. *A.B.T. Mfg. Co.*, 188 F.2d 706, 709 (7th Cir. 1951); see also *Electric Pipe Line, Inc.* v. *Fluid Sys., Inc.*, 250 F.2d 697, 700 (2d Cir. 1957) (rule applies where patent "gave value to components which otherwise would have been useless . . . and would not have been sold"); *Marconi Wireless Tel. Co. of America*, 99 Ct. Cl. at 48 ("[w]ithout the Lodge invention radio had no practical utility"); *Armstrong* v. *Belding Bros. & Co.*, 297 F. 728, 731 (2d Cir. 1924) ("[a]n infringer is liable for the entire profits made by the manufacture and sale of an article containing the patented device, where it appears that, but for the patented feature, the article would not have been salable"). The rule does not apply "where the article has commercial value independent of the patented feature," which can be established by showing that "the defendant sold substantially the same article, minus the patented feature, at a discount." *Hughes Tool Co.*, 491 F.2d at 928-29.

Over the past decade, however, the Federal Circuit has abandoned the limitations this Court had established in the entire market value rule. The Federal Circuit's first significant break from the rule came in *Paper Converting Machine Co.* v. *Magna-Graphics, Corp.*, 745 F.2d 11 (Fed. Cir. 1984). There, the court seized on dicta in one of its earlier cases and held that unpatented items can be included in the computation of damages based on " 'their financial and marketing dependence on the patented item under standard marketing procedures for the goods in question.' " *Id.* at 22-23 (quoting *Leesona Corp.* v. *United States*, 599 F.2d 958, 974 (Ct. Cl. 1981)). The court in *Paper Converting* held that the "standard marketing procedures" test was satisfied if the unpatented items are "routinely purchased" with the patented item simply "to ensure a single source of responsibility" for the products. *Id.* at 23. This lax standard prevailed in subsequent cases. See, *e.g.*, *Kalman* v. *Berlyn Corp.*, 914 F.2d 1473, 1485 (Fed. Cir. 1990) (rule applied where unpatented items "were usually sold with the" patented items).

In *Rite-Hite Corp.* v. *Kelley Co.*, 56 F.3d 1538 (Fed. Cir.) (*en banc*), *cert. denied*, 116 S. Ct. 184 (1995), the Federal Circuit inconclusively addressed *en banc* the scope and applicability of the entire market value rule. No single view commanded a majority. A plurality tacitly acknowledged the lax nature of the "standard marketing procedures" test and sought to impose a modest qualification.[4] In addition to a showing of "marketing or financial dependence," the plurality required that the unpatented items "*function together* with the patented component in some manner so as to produce a desired end product

---

[4] The plurality acknowledged that an emphasis on "marketing dependence" could create the "*appear*[*ance*]" that the entire market value rule was being "expand[ed]" and "separate[d] . . . from its traditional moorings." 56 F.3d at 1550 (emphasis added). As this case reveals, appearances are not always deceiving.

or result." *Id.* at 1550 (emphasis added). Two judges dissented even from this modest qualification of the "standard marketing" test and argued that damages on unpatented items are proper if they are sold merely as a "package" with the patented item. *Id.* at 1581-82; see also *id.* at 1582 (the issue is "not whether the [unpatented item] . . . had an independent market and use"). By contrast, Judge Nies, joined by three other judges, criticized the plurality's approach as inconsistent with the entire market value rule's origins. That rule, she explained, is based on "the commercial magnetism of the patented invention, not on whether components in a machine—or auxiliary goods—function together." *Id.* at 1576.

The profound lack of coherence in the law concerning the entire market value rule has not gone unnoticed. A commentator recently observed that "the law urgently requires clear guidelines regarding the applicability and limits of the various damages rules," particularly the entire market value rule. Brent Rabowsky, *Recovery of Lost Profits on Unpatented Products in Patent Infringement Cases,* 70 S. Cal. L. Rev. 281, 295 (1996). Other commentators have argued that "[t]he Federal Circuit is divided on key issues relating to the legal scope of permissible damages and the doctrinal underpinnings of damages calculations." Karen D. McDaniel & Gregory M. Ansems, *Damages in the Post-Rite-Hite Era: Convoyed Sales Illustrate the Dichotomy in Current Damages Law,* 78 J. Pat. & Trademark Off. Soc'y 461, 481 (1996); Robert J. Cox, *Recent Development: But How Far?: Rite-Hite-Corp. v. Kelley Co.'s Expansion of the Scope of Patent Damages,* 3 J. Intell. Prop. 327, 351-52 (1996) (*Rite-Hite* opens a "potentially vast landscape of compensable harm" that "will result in larger damages awards" and will "engender more, and more complicated, patent infringement suits."). Of course, the Federal Circuit's failure to clarify the problem *en banc* in *Rite-Hite* means that only this Court can provide the kind of guidance that businesses that propose

to bring new products to market and to promote them deserve.

The decision below confirms the Federal Circuit's complete repudiation of this Court's entire market value rule and the triumph of the *Rite-Hite* plurality's "standard marketing procedures" test. The court below held that there was "substantial evidence" to support a damages award "based upon the cost of the entire accused machines" in this case because "GE's own technical literature . . . emphasized the MAO feature." Pet. App. at 15a-16a. The "substantial evidence" that the court of appeals cited consisted, *in its entirety*, of three sentences taken from two GE brochures. In one, GE noted that MAO capabilities "offer direct acquisition of multiple view angles in one acquisition," and in the other GE described MAO as a "recent advance" that "is helping to enhance efficiency and patient throughput" by "allow[ing] a single scan to be graphically prescribed with each slice—or group of slices—acquired at a different angle." *Id.* Thus, the Federal Circuit imposes no requirement on a plaintiff to prove that "no . . . sales would have been effected" in order to claim the value of the entire invention as the basis for calculating damages. *Cowing*, 105 U.S. at 256.

If the lower court had applied the entire market value rule as set forth by this Court instead of its lax "standard marketing procedures" test, it could not have affirmed the jury's damages award. It is undisputed and indisputable that MRI scanners without MAO are not commercially "worthless" (*Crosby Steam-Gage & Valve Co.*, 141 U.S. at 453), "useless" (*Electric Pipe Line, Inc.*, 250 F.2d at 700), unsalable (*id.*), or devoid of practical utility. *Marconi Wireless Tel. Co. of America*, 99 Ct. Cl. at 48. For example, as noted above (page 6, *supra*), the MAO feature is just one of many features on an MRI machine (the 39th out of the 52 that Fonar touted) and one that is frequently not used. It is an optional feature

that many customers choose not to purchase at all—as evidenced by GE's proven ability to sell more than five times as many scanners without the feature as Fonar was able to sell with the feature. *Id.*

Nearly 150 years ago, this Court explained that it would be a "grave error" if "one who has patented an improvement in any portion of a . . . complex machine[] may recover the whole profits arising from the skill, labor, material, and capital employed in making the whole machine" because, under such a rule, "even the smallest part is made equal to the whole" and the manufacturer "may be compelled to pay . . . his whole profits to each of a dozen or more several inventors of some small improvement." *Seymour* v. *McCormick*, 57 U.S. (16 How.) 480, 490-91 (1853). That is precisely what happened to GE.

The Court's rationale is, if anything, even more germane today. Competition often centers around modest improvements—many of them patented—that allow competitors to differentiate their products. MRI scanners embody numerous patented ideas—GE's MRI systems are subject to 16 licenses covering more than 100 patents (C.A. App. A5278-82)—each of which adds value to the overall machine. And, it is a standard marketing principle for competitors selling physically similar products to emphasize in their advertising modest differences in the products.[6] Yet, under the Federal Circuit's test, market-

---

[6] *See* William M. Pride & O.C. Ferrell, *Marketing: Basic Concepts and Decisions* 38-40 (4th ed. 1985) ("A marketer who uses product differentiation rarely designs a product that is very different physically from other brands. . . . Because the product actually is not much different from competing brands, marketers rely heavily on promotional efforts to emphasize one or several small differences"); Robert F. Hartley, *Marketing Successes: Historical to Present Day: What We Can Learn* 234 (reviewing marketing strategy over the century and concluding that "[i]n . . . all the cases we have studied, strong efforts were exerted to maintain a distinctive brand and presence") (1996); Wendell R. Smith, *Product Differentiation and Market Segmentation as Alternative Marketing Strategies*, 21 J. Mktg. 8 (1956), *reprinted in Managerial Marketing: Perspectives and Viewpoints* 203 (Eugene J. Kelley & William

ing statements about these patented features would entitle the owner of each patented improvement to collect damages for the full value of the scanner, and thus to recover profits attributable to the ideas of others.

The Federal Circuit's evisceration of the entire market value rule, moreover, coincides with a period of unprecedented growth in patent damage awards and is sure to fuel that growth. A study of patent damage awards that the Federal Circuit affirmed between 1982 and 1996 showed that seven of the top 10 affirmed damages awards, and 16 of the highest 25 affirmed awards, were rendered in the last five years. *Intellectual Property Damages: An Analysis of Patent Damage Awards 1982-June 1996* (Arthur Anderson LLP 1996).[6] See also, Julie L. Davis, *Patents Infringement Damage Awards 1982-1994*, Licensing Law and Business Report, May-June 1995, Vol. 17, No. 7 (Clark Boardman Callaghan) at 74. A rule that permits recovery for the entire value of products based on mere marketing statements about an improvement to that product can only exacerbate this trend.

The consequence of allowing enormous recoveries for modest improvements is an increase in the number of patent lawsuits, their uncertainty and their length. Every patented improvement of any relatively expensive product will generate a significant claim for damages that not only provides tremendous incentives to putative plaintiffs and their counsel to pursue litigation, but also discourages those same plaintiffs from seriously entertaining reasonable settlement proposals.

Lazer, eds. 1967) ("Success in planning marketing activities requires precise utilization of both product differentiation and market segmentation as components of marketing strategy").

[6] Moreover, because the study was limited to decisions reported either in the United States Patent Quarterly or on Lexis, it does not include another six awards of $31 million or more, each of which would fall within the top 20 awards. *Intellectual Property Damages: An Analysis of Patent Damage Awards 1982—June 1996* (Arthur Andersen LLP 1996).

The argument for review by this Court was made most convincingly and succinctly by Judge Nies in response to the denial of rehearing in *King Instrument Corp.* v. *Perego*, 72 F.3d 855 (Fed. Cir. 1995), *cert. denied*, 116 S. Ct. 1675 (1996). There, Judge Nies argued:

> The *Rite-Hite* decision presents, in my view, the most profound departure from basic patent law concepts that any court has ever pronounced. Moreover, as the decision in this case indicates, the *Rite-Hite* decision was not an aberration—a one-time occurrence. *Rite-Hite* provides the jumping off place for further extension of damages beyond injury to patent rights.

Id. at 857. If *Rite-Hite* was the jumping off place, then this Court should make *Fonar* the end point and bring this extravagant doctrine to a halt. In sum, the Court should grant the petition to consider this critical issue in patent law.

2. Compounding the lower court's erroneous application of the entire market value rule was its decision on liability to reinstate a $35 million infringement verdict based on a theory of equivalents that the jury never heard and on which it received no meaningful instruction. In *Hilton-Davis*, this Court expressed deep concern that "the doctrine of equivalents . . . has taken on a life of its own." 117 S. Ct. at 1048-49. Indeed, the Court noted that "the doctrine of equivalents, when applied broadly, conflicts with the definition and public-notice functions of the statutory claiming requirement" (*id.* at 1049), a problem exacerbated by "black-box jury verdicts." *Id.* at 1053 n.8. The year before, the Court observed that there must be "uniformity in the treatment of a given patent," and had taken its first significant step in years towards promoting that goal by ruling that the construction of patent claims is a question of law for courts to undertake. *Markman* v. *Westview Instruments, Inc.*, 116 S. Ct. 1384, 1387 (1996). In *Hilton-Davis* the Court again recognized the need to provide a greater clarity in patent law. To be

sure, the Court left application of the doctrine of equivalents to juries, but did so subject to the requirement that "procedural improvements" be "implement[ed]" to promote "certainty, consistency and reviewability [in] this area of the law." 117 S. Ct. at 1053 n.8.

Over a decade ago, the Federal Circuit sought to prevent unguided and unreviewable jury verdicts under the doctrine of equivalents by requiring patentees to propound an explicit equivalents theory to the jury and to explain to the jury how particular trial testimony supported that theory. In *Nestier Corp.* v. *Menasha Corp.-Lewisystems Div.*, 739 F.2d 1576, 1579 (Fed. Cir. 1984), a five-judge panel of the court ruled that a theory of infringement by equivalents cannot merely be subsumed within a patentee's case of literal infringement.

Five years later, the court further explained the rule of *Nestier* and reversed a verdict under the doctrine of equivalents, holding that the jury had been "put to sea without guiding charts" because of the absence of "particularized testimony and linking argument" under the doctrine of equivalents. *Lear Siegler, Inc.* v. *Sealy Mattress Co.*, 873 F.2d 1422, 1426 (Fed. Cir. 1989). Although, for a short time thereafter, the Federal Circuit properly treated the requirement of particularized testimony and linking argument as binding and vital (*see Malta* v. *Schulmerich Carillons, Inc.*, 952 F.2d 1320, 1327 (Fed. Cir. 1991)), just last year a panel of that court disavowed the requirement, stating that, in the aftermath of its *en banc* decision in *Hilton-Davis*, "no specific formulation of evidence and argument is required." *National Presto Indus., Inc.* v. *West Bend Co.*, 76 F.3d 1185, 1191 (Fed. Cir. 1996). But *cf. Texas Instruments, Inc.* v. *Cypress Semiconductor Corp.*, 90 F.3d 1558, 1566-1567 (Fed. Cir. 1996) (holding that *Lear Siegler* is still good law, but acknowledging tension created by opinion in *National Presto*), *cert. denied*, 117 S. Ct. 1818 (1997).

Thus, just as this Court in *Hilton-Davis* was insisting that limiting procedural requirements are absolutely critical to ensuring that the doctrine of equivalents can be properly restricted, which is precisely the function of the particularized testimony and linking argument rule—the court of appeals was jettisoning that requirement. In the decision below, the court did not even mention the *Nestier/Lear Siegler* rule and was completely unconcerned that the theory of equivalents upon which it reinstated the jury's verdict was one that had not actually been presented to the jury. The very fact that Fonar presented one theory of equivalents in its opening brief on appeal—the theory Fonar had presented to the jury—and a completely different theory in its reply brief (*see* page 8, *supra*), confirms that the jury never considered, in its meager deliberations, the theory of infringement the court below adopted. At a minimum, this discrepancy underscores the necessity of the particularized testimony and linking argument requirement: Before it can sustain a jury verdict of tens of millions of dollars, the Federal Circuit must ensure that the theory of equivalents argued on appeal at least was presented to the jury.

This case starkly demonstrates the impermissible and innovation-chilling uncertainty this Court sought to end in *Hilton-Davis* but which the Federal Circuit has encouraged by its failure to subject jury findings of equivalence to the requirement of particularized testimony and linking argument. Indeed, the lesson to be derived from the Federal Circuit's treatment of the '832 patent—and one that certainly will not be lost on patentees—is that the proof of equivalence should be presented to unsophisticated lay juries in the vaguest and most generalized manner possible. Such an approach both maximizes the chance of success at trial and preserves the greatest flexibility for preserving success on appeal.

At the end of the day, the Court should grant the second question presented to decide whether the "particu-

larized testimony and linking argument" requirement is now mandatory in all equivalence cases in light of *Hilton-Davis*. Only by timely review of this issue can the Court effectively promote "certainty, consistency and reviewability" in the doctrine of equivalents, which is critical to the rational resolution of litigated disputes concerning intellectual property.[7]

---

[7] The panel's opinion in this case was issued less than one week before this Court's decision in *Hilton-Davis*. As a consequence, GE argued that the panel should reconsider its ruling in light of this Court's intervening treatment of the equivalents doctrine, which the court of appeals purported to apply. The court of appeals denied rehearing without comment. In so doing the court of appeals simply ignored this Court's admonition that "procedural improvements" designed to improve "certainty, consistency and reviewability" are vital to the effective implementation of the equivalents doctrine. *Warner-Jenkinson Co.* v. *Hilton-Davis Chem. Co.*, 117 S. Ct. 1040, 1053. In other cases decided before *Hilton-Davis* was released, the Court has vacated and remanded to permit the losing party a full opportunity to have this Court's analysis considered by the Federal Circuit. *See, e.g., Litton Sys., Inc.* v. *Honeywell, Inc.*, 87 F.3d 1559 (Fed. Cir. 1996), *vacated and remanded*, 117 S. Ct. 1240 (1997); *Festo Corp.* v. *SMC Corp.*, 72 F.3d 857 (Fed. Cir. 1995), *vacated and remanded*, 117 S. Ct. 1240 (1997). Simple fairness dictates that GE should be treated similarly and given the opportunity at a minimum to demonstrate as a matter of right the effect of *Hilton-Davis* on the proper disposition of this case.

CONCLUSION

The petition for a writ of certiorari should be granted.

Respectfully submitted,

BENJAMIN W. HEINEMAN, JR.
BRACKETT B. DENNISTON, III
ERWIN F. BERRIER, JR.
MOLLY B. BURKE
GENERAL ELECTRIC COMPANY
3135 Easton Turnpike
Fairfield, CT 06431
(203) 373-2211

CARTER G. PHILLIPS *
MARK E. HADDAD
JOSEPH R. GUERRA
SIDLEY & AUSTIN
1722 Eye Street, N.W.
Washington, D.C. 20006
(202) 736-8000

DONALD R. DUNNER
THOMAS H. JENKINS
J. MICHAEL JAKES
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.
1300 I Street, N.W.
Washington, D.C. 20005
(202) 408-4000

Counsel for Petitioners

* Counsel of Record

August 6, 1997

APPENDICES

APPENDIX A

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

96-1075,-1106,-1091

FONAR CORPORATION and
DR. RAYMOND V. DAMADIAN,
Plaintiffs/Cross-Appellants,

v.

GENERAL ELECTRIC COMPANY,
and DRUCKER & GENUTH, MDS, P.C.,
d/b/a SOUTH SHORE IMAGING ASSOCIATES,
Defendants-Appellants.

DECIDED: February 25, 1997

Before LOURIE, *Circuit Judge,* SKELTON, *Senior Circuit Judge,* and RADER, *Circuit Judge.*

LOURIE, *Circuit Judge.*

General Electric Company, and Drucker & Genuth, MDS, P.C., d/b/a South Shore Imaging Associates (collectively "GE") appeal from the judgment of the United States District Court for the Eastern District of New York denying their motion for judgment as a matter of law ("JMOL") and sustaining a jury's verdict that (1) U.S. Patent 4,871,966 was not invalid and (2) GE infringed the '966 patent and was liable for lost profits and reasonable royalty damages. *Fonar Corp. v. General Elec. Co.,*

902 F. Supp. 330 (E.D.N.Y. 1995). Fonar Corporation and Dr. Raymond V. Damadian (collectively "Fonar") cross-appeal from the district court's judgment granting a motion for JMOL that GE did not induce infringement of the '966 patent and did not infringe U.S. Patent 3,789,832. *Id.* Because the district court erred in its JMOL that GE did not infringe the '832 patent, but did not otherwise err, we affirm-in-part and reverse-in-part.

BACKGROUND

The '966 patent concerns a technique for using a magnetic resonance imaging ("MRI") machine in order to obtain multiple image slices of a patient's body at different angles in a single scan, referred to as multi-angle oblique ("MAO") imaging. Prior art machines were able to obtain multiple parallel images along the same axis in a single scan, but they required multiple scans in order to obtain multiple images at varying angles. MAO resulted in shortened imaging times and hence allowed for the imaging of more patients per day. Claim 1 of the '966 patent recites this feature and reads in part:

> 1. A method for obtaining in the course of a single scan NMR [nuclear magnetic resonance] image data for a plurality of differently oriented selected planes in an object using nuclear magnetic resonance techniques, said method comprising the steps of:
>
> (a) positioning an object in a static homogeneous magnetic field;
>
> (b) determining first and second selected planes in said object for which NMR image data is to be obtained . . .
>
> (c) subjecting said object to a plurality of repetitions of a first repetition sequence composed of NMR excitation and magnetic field gradient pulses, each of said repetitions of said first repetition sequence

including the steps of applying an excitation pulse and reading out of an NMR signal produced by said excitation pulse . . . said plurality of repetitions of said first repetition sequence being carried out in a manner to encode spatial information into a first collection of said NMR signals, said first collection of NMR signals being representative of NMR image data for said first selected plane; and

(d) subjecting said object to a plurality of repetitions of a second repetition sequence composed of NMR excitation and magnetic field gradient pulses, each of said repetitions of said second repetition sequence including the steps of applying an excitation pulse and reading out of an NMR signal produced, by said excitation pulse . . . said plurality of repetitions of said second repetition sequence being carried out in a manner to encode spatial information into a second collection of NMR signals, said second collection of NMR signals being representative of NMR image data for said second selected plane;

said plurality of repetitions of said first and second repetition sequences each being carried out during the course of a single scan of said object and each being continued substantially throughout said single scan, the repetition time interval for repeating each of said first and second repetition sequences being substantially the same and said steps of applying an excitation pulse and reading out of an NMR signal for each repetition of said second repetition sequence being performed at a different time during said repetition time interval than each of said steps of applying an excitation pulse and reading out of an NMR signal for said first repetition sequence.

The '832 patent concerns a technique for using NMR imaging to detect cancer. MRI machines rely upon the principles of NMR to produce cross-sectional images of

body tissue. The inventor, Dr. Damadian, recognized that two common NMR measurements, T1 and T2, were often different in cancerous tissue compared with normal tissue. Thus, the '832 patent claims a method for detecting cancer by measuring values of T1 and T2 in suspect tissue and comparing them to standard T1 and T2 values for normal and cancerous tissue of the same type. Claim 1 of the '832 patent recites this feature and reads:

> 1. A method for detecting cancer comprising:
>
> a. measuring and establishing standard NMR spin-lattice relaxation times and spin-spin relaxation times for both normal and cancerous tissue of the type under analysis using as an indictor nuclei at least one nuclei which exhibits deviant behavior in cancerous tissue;
>
> b. measuring the NMR spin-lattice relaxation times and spin-spin relaxation times for the suspected tissue to determine the extent of deviant behavior of the indicator nuclei; and
>
> c. comparing the values obtained in (b) against the standards obtained in (a).

Fonar sued GE for infringement of the two patents, asserting infringement of claims 1, 2, 4, 5, and 12 of the '966 patent and claims 1 and 2 of the '832 patent. A jury returned a verdict finding that the asserted claims were not invalid and were infringed. As compensation for infringement of the '966 patent, the jury awarded Fonar $27,825,000 as lost profits on 75 of the 600 MRI machines sold by GE and $34,125,000 as a reasonable royalty on sales of the remaining 525 machines. The jury awarded Fonar $13,625,000 as damages for GE's inducement to infringe the patent. It also awarded $35,000,000 in reasonable royalty damages for GE's infringement of the '832 patent.

The court granted two of GE's renewed motions for JMOL, ruling that GE did not induce infringement of the '966 patent and that it did not infringe the '832 patent. Specifically, the court concluded that GE could not have induced infringement because it had no notice of the patent. With respect to infringement of the '832 patent, the court found that Fonar failed to establish the existence of standard T1 and T2 values, which are limitations of the asserted claims, and it thus concluded that GE did not infringe that patent.

The court denied GE's motions for JMOL relating to its assertion of a violation of the best mode requirement and to damages for direct infringement of the '966 patent. The court concluded that the testimony of Fonar's witnesses provided substantial evidence to support the jury's finding that the patent satisfied the best mode requirement, and the court found that substantial evidence supported the jury's damages findings. The court summarily denied GE's motions for JMOL relating to the other issues now on appeal. The court awarded Fonar prejudgment interest and entered a final award against GE in the amount of $68,421,726.

GE now appeals to this court, arguing that the district court erred in its judgment concerning validity and infringement of the '966 patent and in determining damages for infringement of that patent. Fonar cross-appeals, challenging the district court's judgment concerning inducement to infringe the '966 patent and infringement of the '832 patent.

DISCUSSION

On appeal from a judgment denying a motion for JMOL following a jury trial, an appellant "must show that the jury's findings, presumed or express, are not supported by substantial evidence or, if they were, that the legal conclusion(s) implied from the jury's verdict cannot in law be supported by those findings." *Perkin-Elmer Corp. v. Com-*

putervision Corp., 732 F.2d 888, 893, 221 USPQ 669, 673 (Fed. Cir. 1984) (citation omitted).

A. *Best Mode at the '966 patent*

GE argues that the patent fails to disclose two software routines, the LGRAD and GETMAO programs, which the inventors testified were the best means they knew of to accomplish MAO imaging. GE also argues that a critical aspect of the invention, a gradient multiplier board ("GMB"), was not disclosed in sufficient detail to satisfy the best mode requirement. Furthermore, GE argues that the inventors failed to identify a new integrated circuit "chip" for implementing certain functions of the hardware.

Fonar responds that its disclosure was adequate to satisfy the best mode requirement, that the specification adequately describes the functions of the software, and that it is not necessary that the actual computer program be disclosed. According to Fonar, providing a description of the software's functions is what is important for a best mode disclosure, rather than actual source code, because the code was tailored to a specific hardware embodiment and it thus would not necessarily have worked with other hardware. Fonar also argues that the '966 specification adequately disclosed the GMB and the functions of the new "chip."

The patent statute requires that a patent specification "shall set forth the best mode contemplated by the inventor of carrying out his invention." 35 U.S.C. § 112 (1994). Determining whether a patent satisfies the best mode requirement involves two factual inquiries. First, a fact-finder must determine whether at the time an applicant filed an application for a patent, he or she had a best mode of practicing the invention; this is a subjective determination. Second, if the inventor had a best mode of practicing the invention, the fact-finder must determine whether the best mode was disclosed in sufficient detail

to allow one skilled in the art to practice it, which is an objective determination. *United States Gypsum Co. v. National Gypsum Co.*, 74 F.3d 1209, 1212, 37 USPQ2d 1388, 1390 (Fed. Cir. 1996); *Chemcast Corp. v. Arco Indus. Corp.*, 913 F.2d 923, 927-28, 16 USPQ2d 1033, 1036 (Fed. Cir. 1990).

We agree with Fonar that the jury's finding that the '966 patent satisfied the best mode requirement was supported by substantial evidence. There was evidence that the inventors had a best mode, and that the software, the GMB, and the "chip" were part of that best mode. However, with respect to the software routines, Fonar's witnesses testified that the '966 patent contained a sufficient description of the software's functions. Specifically, Robert Wolf, one of the inventors, testified as follows:

> Q. From that written description, is there sufficient description to a software engineer, such as yourself, of what software needs to be written in order to perform the multi-angle oblique invention?
>
> A. Yes.
>
> . . .
>
> Q. In any event, the software, itself, as we see in the hundred pages of Exhibit 816, is not reproduced in its entirety in the patent.
>
> Is that right?
>
> A. That's correct.
>
> Q. Why is that?
>
> A. For a few reasons.
>
> First of all, it's large as you can see. It's several hundred pages. It wouldn't help someone to have that software anyway because that software only works on a Fonar machine.

> What's much more important is to have a description of what the software has to do, and that is what you will find in the patent.

Fonar's witnesses further testified that providing the functions of the software was more important than providing the computer code. We agree.

As a general rule, where software constitutes part of a best mode of carrying out an invention, description of such a best mode is satisfied by a disclosure of the functions of the software. This is because, normally, writing code for such software is within the skill of the art, not requiring undue experimentation, once its functions have been disclosed. It is well established that what is within the skill of the art need not be disclosed to satisfy the best mode requirement as long as that mode is described. Stating the functions of the best mode software satisfies that description test. We have so held previously and we so hold today. *See In re Hayes Microcomputer Prods., Inc. Patent Litigation*, 982 F.2d 1527, 1537-38, 25 USPQ2d 1241, 1248-49 (Fed. Cir. 1992); *In re Sherwood*, 613 F.2d 809, 816-17, 204 USPQ 537, 544 (CCPA 1980). Thus, flow charts or source code listings are not a requirement for adequately disclosing the functions of software. *See Sherwood*, 613 F.2d at 816-17, 204 USPQ at 544. Here, substantial evidence supports a finding that the software functions were disclosed sufficiently to satisfy the best mode requirement. *See Hayes*, 982 F.2d at 1537, 25 USPQ2d at 1248-49 (stating that there was no best mode violation where the specification failed to disclose a firmware listing or flow charts, but did disclose sufficient detail to allow one skilled in the art to develop a firmware listing for implementing the invention).

A finding that the GMB was sufficiently disclosed to satisfy the best mode requirement was also supported by substantial evidence. Fonar's witness testified that the '966 patent provided a description of the function of the

BEST AVA

GMB with reference to the components within the dotted line in Figure 7 of the '966 patent, reproduced below.

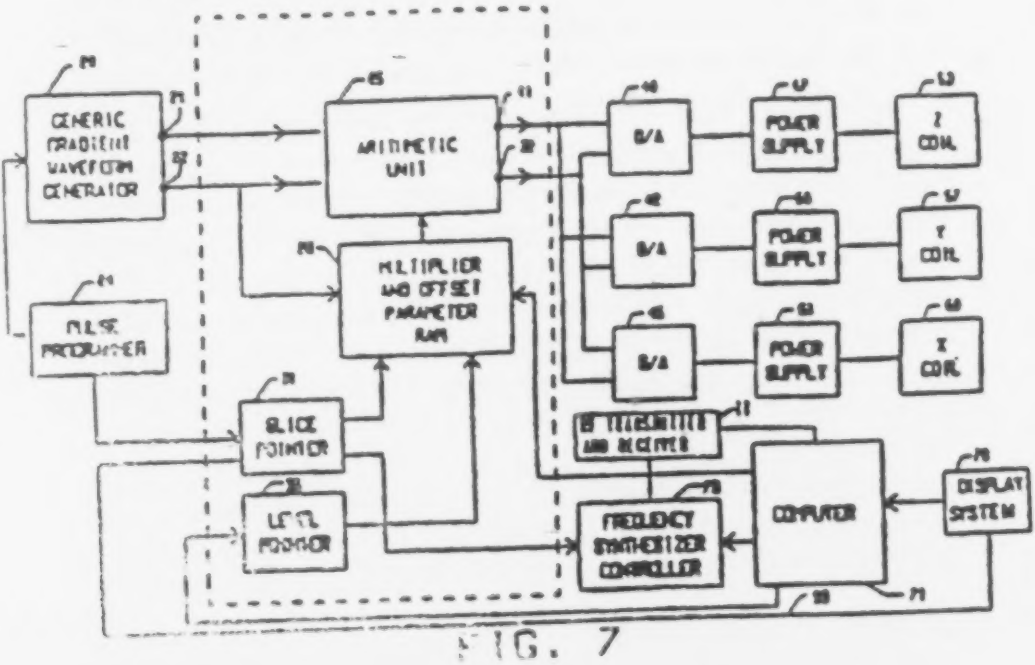

FIG. 7

David Hertz, one of the inventors, testified in particular that the patent provides a description of the functions required for one skilled in the art to build a GMB that will work with a general MRI system and that the GMB disclosed in the patent is the one built by Fonar. More importantly, he testified that the GMB used in the Fonar machine was not the only means to accomplish MAO imaging and that it was not necessarily the best way to do it for every machine. GE argues nonetheless that the '966 patent failed to disclose the use of comparators as part of the GMB, which it alleged were an essential element of the best mode. However, Hertz testified that if an MRI machine performing MAO imaging according to the '966 patent were to require a comparator as part of the GMB, a skilled engineer would know that a comparator should be used. He further testified that each MRI machine has

LABLE COPY

its own set of requirements for the functionality of the GMB, which is why the '966 patent described in general terms how to build the invention. Hertz's testimony provides substantial evidence to support a finding that there was no best mode violation with respect to the GMB.

Substantial evidence also supports the finding that the functions of the new "chip" were disclosed sufficiently to satisfy the best mode requirement. The '966 patent schematically disclosed the functions of that "chip" in Figure 7 and provided a textual description of its functions. *See* '966 patent, col. 13, lines 41-64. Because adequate disclosure of the functions of the "chip" was in the specification, failure to specifically identify a particular manufacturer's "chip" was not fatal to satisfaction of the best mode requirement. Accordingly, the jury's finding that the '966 patent satisfied the best mode requirement was supported by substantial evidence, and the district court did not err in denying GE's motion for JMOL concerning that issue.

B. *Direct Infringement of the '966 Patent*

GE argues that it was entitled to a judgment that its MRI scanners did not infringe the '966 patent. According to GE, each asserted claim contains limitations subject to 35 U.S.C. § 112, ¶ 6, and Fonar submitted no evidence indicating that the accused devices possessed the structure, material, or acts noted in the specification that performed the functions identified by the "means" or "step" limitations. GE argues that its accused scanners did not contain equivalent structure because it did not use a generic gradient waveform.

Fonar responds that the asserted claims are not limited to use of a generic gradient waveform. Fonar points to the specification, which it notes clearly states that other waveforms may be used. It also asserts that while some claims require a generic gradient waveform generator, others do not. Fonar also argues that it submitted evi-

dence that GE's machines used the same or equivalent structure or acts for implementing the functions specified by the asserted claims. In any event, Fonar believes that most of its claims do not contain means plus function language and are accordingly not limited to structure or acts disclosed in the specification, or equivalents thereof.

Determining whether a patent claim has been infringed requires a two-step analysis: "First, the claim must be properly construed to determine its scope and meaning. Second, the claim as properly construed must be compared to the accused device or process." *Carroll Touch, Inc. v. Electro Mechanical Sys., Inc.*, 15 F.3d 1573, 1576, 27 USPQ2d 1836, 1839 (Fed. Cir. 1993).

We first address GE's argument that the asserted claims, including method claims, are subject to section 112, ¶ 6. We deal with the method claims first. GE argues in particular that each asserted method claim invokes section 112, ¶ 6, because it was drafted "functionally in a result-oriented way" by reciting that the pulse sequences must be applied in a manner to encode spatial information without reciting structure or acts that would enable such a result.

We need not address the question whether section 112, ¶ 6, applies to these claims. That is because we agree with Fonar that the method claims looked at with or without the section 112, ¶ 6 limitation are not limited to use of a generic gradient waveform. Although the '966 specification discloses a "generic gradient waveform generator" (20) in Figure 7, along with a corresponding description, it states that the "generator 20 also stores the phase encoding waveform, as illustrated in FIG. 2, in digital form. Preferably, the generator 20 stores these particular waveforms; but, may store others that suffice for purposes of the present invention." Col. 12, lines 42-46. The claim language in question, applying pulses in a manner to encode spatial information, does not recite use of generic

gradient waveforms; it tracks the specification which states that other waveforms may be used.

There was substantial evidence to support the jury's finding that the method claims were infringed. Thomas Gafford, as expert witness for Fonar, testified that the accused devices infringed the asserted claims because they performed the steps defined in the claims using the same or equivalent acts. He stated that in forming his opinion he relied upon the technical literature, specifications, and drawings of the accused GE machines. The jury could have reasonably relied upon his testimony in rendering its verdict that the accused machines met the limitations of the asserted claims however they are interpreted; its finding of infringement is thus supported by substantial evidence.

As for apparatus claim 12, it does include means clauses. The limitations that GE argues are subject to section 112, ¶ 6, are shown below with our emphasis added.

> 12. Apparatus for . . .
>
> (c) *means* for actuating and controlling said magnetic field applying means and said radio frequency applying means to:
>
> (1) apply a first sequence including a first slice selector magnetic field gradient in a first direction concomitantly with a first RF excitation pulse at a first frequency to thereby excite nucleii [sic] only in a first plane perpendicular to said first direction, whereby a first NMR signal will be emitted only by nucleii [sic] in said first plane, said first sequence further including at least one encoding magnetic field gradient operative *to encode spatial information into said first NMR signal;*

> (2) apply a second sequence including a second slice selector magnetic field gradient in a second direction different from said first direction concomitantly with a second RF excitation pulse at a second frequency different from said first frequency to thereby excite nucleii [sic] only in a second plane perpendicular to said second direction whereby a second NMR signal will be emitted only by nucleii [sic] in said second plane, said second sequence further including at least one encoding magnetic field gradient operative *to encode spatial information into said second NMR signal;* . . .

An apparatus claim requires definite structure in the specification to support the function in a means clause. Because claim 12 does not recite such structure in support of the defined function, it is therefore subject to section 112, ¶ 6. *See Cole v. Kimberly-Clark Corp.*, 102 F.3d 524, 531, 41 USPQ2d 1001, 1006 (Fed. Cir. 1996); *see also Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F3d 1580, 1584, 39 USPQ2d 1783, 1787 (Fed. Cir. 1996) (stating that "the use of the term 'means' has come to be so closely associated with 'means-plus-function' claiming that it is fair to say that the use of the term 'means' (particularly as used in the phrase 'means for') generally invokes section 112(6) and that the use of a different formulation generally does not."). Accordingly, we construe the "means" limitation in question in light of the corresponding structure or acts disclosed in the specification and their equivalents. *Johnston v. IVAC Corp.*, 885 F.2d 1574, 1580, 12 USPQ2d 1382, 1386-87 (Fed. Cir. 1989). The '966 specification discloses use of a generic gradient waveform. Although it states that other waveforms may be used, it fails to specifically identify those waveforms. Thus, under section 112, ¶ 6, claim 12 is limited to use of a generic gradient waveform and its equivalents.

We also conclude that the jury's finding that the accused machines contained the elements of the apparatus claim is supported by substantial evidence. Gafford testified that the accused devices infringed claim 12 because they performed the identical functions as specified, contained the same or equivalent structure, and performed the steps defined in the claim using the same or equivalent acts. He stated that in forming his opinion he relied upon the technical literature, specifications, and drawings of the accused GE machines. The jury could have reasonably relied upon his testimony in rendering its verdict that the accused machines met the limitations of the asserted claim, and contained equivalent structure or acts where necessary to meet the limitations subject to section 112, ¶ 6; its finding of infringement is thus supported by substantial evidence. *See Consolidated Edison Co. v. National Labor Relations Bd.;* 305 U.S. 197, 229 (1938) (defining substantial evidence as "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion"). Accordingly, the district court did not err in denying GE's motion for JMOL concerning direct infringement of the asserted claims of the '966 patent.

C. *Damages for Infringement of the '966 Patent*

GE argues that the jury's findings concerning damages were not supported by substantial evidence. It argues that reasonable royalty damages were incorrectly based upon the sales of the entire MRI machines rather than the value of the improvement covered by the claimed invention, and that Fonar submitted no substantial evidence to show that the MAO feature was the basis for the customer demand for the entire machine. It argues that the effective royalty rate awarded has no support in the record and that the evidence indicated that GE entered into sixteen license agreements in which the royalty rate was significant lower.

Fonar responds that GE incorrectly assumes that Fonar would have licensed the technology to a competitor for

the same rate that it would have licensed a customer. Furthermore, Fonar argues that the entire market value rule entitles it to a royalty based upon the value of the entire MRI machine even when the patented feature was only a part of it, and that testimony by Fonar's witnesses supported an even higher royalty than that awarded by the jury.

The patent statute provides that

> Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court.

35 U.S.C. § 284 (1994).

Under the entire market value rule, it was not improper for the jury to base a reasonable royalty on the value of the entire accused MRI machines. That rule "allows for the recovery of damages based on the value of an entire apparatus containing several features, even though only one feature is patented." *Paper Converting Mach. Co. v. Magna-Graphics Corp.*, 745 F.2d 11, 22, 223 USPQ 591, 599 (Fed. Cir. 1984). This is permitted when the patented feature is the basis for customer demand for the entire machine. *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1549, 35 USPQ2d 1065, 1073 (Fed. Cir.) (in banc), *cert. denied*, 116 S. Ct. 184 (1995). There was evidence from which the jury could have concluded that was the case here. GE's own technical literature of record emphasized the MAO feature. A brochure for GE's Signa machine highlighted MAO in 1987, stating that "[m]ultislice, multi-angle capabilities offer direct acquisition of multiple view angles in one acquisition." Several other brochures of GE machines also identified the MAO feature. One GE brochure, entitled "Multi-angle MR imag-

ing," states that: "A recent advance at GE Medical Systems, however, is helping to enhance efficiency and patient throughput. Multi-angle imaging, featured on all Signa® systems, allows a single scan to be graphically prescribed with each slice—or group of slices—acquired at a different angle." There was thus substantial evidence to support an award of a reasonable royalty based upon the cost of the entire accused machines.

We agree with Fonar that the jury's award of reasonable royalty damages was also supported by substantial evidence. Dr. Laurits Christensen, an expert witness for Fonar, testified that one-quarter to one-third of the anticipated profits on the sale of the infringing machines would have constituted a reasonable royalty and that this estimate would have resulted in a royalty of 7.25 percent, or $54 million, for the 525 accused machines. This was higher than the royalty of $34.125 million awarded by the jury. Also, GE had itself entered into a license agreement for MRI technology at a rate of seven percent.

GE argues that the lost profits award on all of its sales incorrectly assumed that Fonar would have made sales in markets in which Fonar did not compete with GE. GE argues that Fonar failed to adequately prove that there was a lack of noninfringing substitutes. Fonar responds that there were no noninfringing substitutes, that purchasers were motivated to buy the machines because of the MAO feature and that the alleged substitutes lacked that feature. Fonar also asserts that it had the capacity to manufacture and sell the machines whose sales it lost to GE.

In order to be entitled to lost profits, a patentee must show a reasonable probability that it would have made the sales "but for" the infringement. *Rite-Hite*, 56 F.3d at 1545, 35 USPQ2d at 1069. This may be done by means of the four-factor *Panduit* test, requiring proof of demand for the patented product, lack of acceptable noninfringing substitutes, capacity by the patentee to meet the demand,

and the amount of profit patentee would have made. *See Panduit Corp. v. Stahlin Bros. Fibre Works, Inc.*, 575 F.2d 1152, 1156, 197 USPQ 726, 729-30 (6th Cir. 1978). "The burden then shifts to the infringer to show that the inference is unreasonable for some or all of the lost sales." *Rite-Hite*, 56 F.3d at 1545, 35 USPQ2d at 1069.

We agree with Fonar that the jury's award of lost profits was supported by substantial evidence. Dr. Damadian testified that there was no acceptable alternative to MAO imaging. He testified that the available alternatives would have led to a significant compromise in speed and quality in comparison to using MAO. One alternative, according to Dr. Damadian, would have been 3D imaging. He testified, however, that in using 3D imaging, the amount of time required to collect the data would have resulted in a prohibitively long time for a patient to remain in a scanner. Other techniques referred to as 'fast imaging techniques such as fast spin echo or echo plane" would have involved obtaining single scanned "slices" at a high speed and converting them into an assembly of multiple angles; however, Dr. Damadian testified that these techniques would save resulted in an unacceptable image quality. In addition to this evidence that no acceptable alternative to MAO imaging existed, Dr. Christensen testified that all competing machines with the MAO capability infringed the '966 patent.

There was also substantial evidence that Fonar had the capacity to manufacture machines whose sales it lost. Through the testimony of Dr. Damadian, Fonar proved that in 1988 it could manufacture eight machines per month. He testified that in 1989, Fonar had 600-650 employees and a fast growth rate, having appeared for two consecutive years on Inc. magazine's list of the fastest growing companies. Based on Fonar's growth rate, Dr. Damadian testified that Fonar's capacity would have increased to 500 machines per year by 1992. Accordingly, the district court did not err in denying GE's motion for

JMOL concerning damages for direct infringement of the '966 patent.

D. *Lapse of the '966 Patent*

GE argues that both the royalty and the lost profits awards must be vacated because Fonar may not recover damages attributable to the period in which the '966 patent was lapsed for lack of a timely maintenance fee payment. It argues that 35 U.S.C. § 41(c)(2) provides rights analogous to intervening rights under reissue patents, and that, under that section, GE had an absolute right to sell MRI machines free of infringement during the time period that the '966 patent lapsed.

Fonar responds that GE did not acquire "intervening rights" to infringe the '966 patent during the relevant time period. According to Fonar, GE's interpretation of section 41(c) is contrary to its language and legislative history; the provision expressly states that upon acceptance of a late maintenance fee the patent shall be considered as not having expired. Fonar argues that the legislative history indicates that the provision applies only to those who first began using or first took steps to begin using a patent that had expired for failure to pay a maintenance fee and that it does not apply to GE, which had infringed the patent since 1992 and did not first begin infringing during the lapse period.

The applicable statutory provision states in relevant part that

> No patent, the term of which has been maintained as a result of the acceptance of a payment of a maintenance fee under this subsection, shall abridge or affect the right of any person or his successors in business who made, purchased or used after the six-month grace period but prior to the acceptance of a mainenance fee under this subsection anything protected by the patent, to continue the use of, or to sell

> to others to be used or sold, the specific thing so made, purchased, or used.

35 U.S.C. § 41(c)(2) (1994).

This provision was intended to protect the rights of those who, in reliance on the lapse, first began using the claimed invention or who first took steps to begin using it during the lapse period. In particular, the legislative history states that

> A provision is included to protect the rights of one who began using or who took steps to begin use of a patent which expired for failure to pay a maintenance fee and which was subsequently reestablished by acceptance of the late payment. The intervening rights provision in section 41(c)(2) is similar to the intervening rights provision in 35 U.S.C. 252 concernng reissued patents.

H. Rep. No. 97-542, at 8 (1982), *reprinted in* 1982 U.S.C.C.A.N. 772. We interpret the language "who made, purchased or used" to mean "who first began to make, purchase, or use anything protected by the patent during the lapse period." It does not immunize discreet products made, used, or sold as part of a continuing commercial effort begun before the lapse. It is undisputed that GE began infringing the '966 patent before it lapsed; it thus did not engage in the type of activity that the statute was intended to protect. Furthermore, the preceding statutory provision states that "[i]f the Commissioner accepts payment of a maintenance fee after the six-month grace period, the patent shall be considered as not having expired at the end of the grace period." 35 U.S.C. § 41(c)(1) (1994). Thus, a patent is retroactively rendered enforceable during the lapse time period when the Commissioner accepts a late payment. Accordingly, GE was not entitled to the protection of section 41(c)(2); the district court did not err in denying GE's motion for JMOL concerning the damages attributable to the lapse period.

E. *Inducement to Infringe the '966 Patent*

In its cross-appeal, Fonar argues that the district court erred when it overturned the jury's verdict finding that GE induced infringement of the '966 patent. It argues that it submitted substantial evidence that GE induced infringement by continuing to service scanners that it sold before receiving notice of the patent. GE responds that Fonar failed to mark the scanners that are the subject of its inducement claim and that there is no liability for inducement to infringe where the original purchaser had a right to repair and service the scanners.

The statute concerning patent marking states in relevant part that

> In the event of failure so to mark, no damages shall be recovered by the patentee in any action for infringement, except on proof that the infringer was notified of the infringement and continued to infringe thereafter, in which event damages may be recovered only for infringement occurring after such notice.

35 U.S.C. § 287(a) (1994).

GE is correct. The machines in question were not marked, so that no damages were recoverable before notice was given. Moreover, servicing of the machines was analogous to repair, *see Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 346, 128 USPQ 354, 359 (1961), and repair is not infringement. If a machine was sold under circumstances that did not subject its seller to damages, then subsequent repair cannot subject it to damages. One is entitled to repair that which is sold free of liability for infringement. Therefore, the district court did not err in granting GE's motion for JMOL that it did not induce infringement of the '966 patent.

F. *Direct Infringement of the '832 Patent*

Fonar argues that it presented substantial evidence of GE's infringement of the '832 patent under the doctrine of equivalents and that the district court therefore erred in granting a motion for JMOL that GE did not infringe that patent. GE responds that its accused machines do not perform the steps of asserted claim 1, either directly or equivalently.

A patent may be infringed under the doctrine of equivalents by manufacture, use, or sale of subject matter equivalent to that literally claimed. Infringement under the doctrine "requires proof of insubstantial differences between the claimed and accused products or processes." *Hilton Davis Chem. Co. v. Warner-Jenkinson Co.*, 62 F.3d 1512, 1521-22, 35 USPQ2d 1641, 1648 (Fed. Cir. 1995), *cert. granted*, 116 S. Ct. 1014 (1996). Infringement under the doctrine is a question of fact, which we review for substantial evidence on appeal from a grant of a motion for a JMOL. *Id.* at 1522, 35 USPQ2d at 1648.

We agree with Fonar that the jury's verdict finding infringement under the doctrine of equivalents was supported by substantial evidence. With respect to element (a) of claim 1, there was evidence showing existence of standard values for T1 and T2. In particular, GE scientists published an article in which they compiled reported values for T1 and T2. P.A. Bottomley et al., *A Review of ^1H Nuclear Magnetic Resonance Relaxation in Pathology: Are T_1 and T_2 Diagnostic?*, Medical Physics, Jan./Feb. 1987, at 1. This evidence provided a showing that GE's machines met step (a) of claim 1 at least equivalently by the insubstantial difference, if any, between standard values required by this limitation and GE's compiled values of T1 and T2.

There was also evidence presented that GE's machines performed an equivalent to step (b) of claim 1. GE's ma-

chines used a T1-weighted image and a T2-weighted image for detecting cancer. A T1-weighted image was a function of T1 and machine parameters; a T2-weighted image was a function of T2 and the machine parameters. There was testimony that the T1- and T2-weighted images were primarily controlled by T1 and T2 respectively. In particular, Dr. Damadian testified that a T1 image was controlled by the T1 relaxation time. Even Dr. Mezrich, GE's expert witness, agreed that T1- and T2-weighted images were images whose contrast was primarily determined by differences in T1 and T2. In its reference manual, GE stated that T1-weighted images "rely heavily on T1 relaxation information." This evidence provided a showing that GE's use of T-1 and T2-weighted images were essentially controlled by the values of T1 and T2 and were thus an insubstantial difference from the use of T1 and T2 values as required by step (b) of claim 1.

Finally, there was evidence that GE's machines performed an equivalent to the comparison required by step (c) of claim 1. There was evidence that GE used its compiled standard values to produce precalibrated gray scale values. When GE's machines scanned suspect tissue in order to obtain a signal strength for a voxel, the volume element in the body corresponding to one pixel in the image, that signal strength was matched to a value within the precalibrated gray scale values. Thus, the assignment of a gray scale value for suspect tissue was determined in effect by a comparison of the tissue's signal strength with the standard values. This evidence provided a showing of insubstantial differences between this determination and the comparison required by step (c) of claim 1. Therefore, there was substantial evidence upon which the jury rendered its verdict finding that the accused machines infringed the asserted claims of the '832 patent under the doctrine of equivalents, and the district court erred in granting the motion for JMOL to the contrary.

COSTS

Each party shall bear its own costs.

CONCLUSION

The district court did not err in its judgment denying GE's motions for JMOL and sustaining the jury's verdict that (1) the '966 patent was not invalid for failure to satisfy the best mode requirement; (2) GE infringed the '966 patent and was liable for lost profits and reasonable royalty damages; and (3) GE was liable for infringement during a time period when the '966 patent lapsed for lack of a timely maintenance fee payment but was subsequently reinstated. It did not err in granting GE's motion for JMOL that it did not induce infringement of the '966 patent, but it did err in granting the motion for JMOL that GE did not infringe the '832 patent. Accordingly, we reverse the district court's judgment granting GE's motion for a JMOL that it did not infringe the '832 patent, and we reinstate the jury verdict infringement of that patent and awarding $35 million in damages as compensation for that infringement. We otherwise affirm the district court's judgment.

AFFIRMED-IN-PART AND REVERSED-IN-PART

APPENDIX B

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

CV 92-4196
(Wexler, J.)

FONAR CORPORATION, a Delaware corporation, and DR. RAYMOND V. DAMADIAN, an individual,
Plaintiffs,

-against-

GENERAL ELECTRIC COMPANY, a New York corporation, and DRUCKER & GENUTH, MDS, P.C., D/B/A SOUTH SHORE IMAGING ASSOCIATES, a New York corporation,
Defendants.

MEMORANDUM & ORDER

WEXLER, District Judge

Fonar Corporation and its founder Dr. Raymond V. Damadian ("Damadian") (collectively, "Fonar") brought the above-referenced patent infringement action, by summons and complaint dated September 1, 1992, against General Electric Corporation and Drucker & Genuth, MDs, P.C., d/b/a South Shore Imaging Associates ("South Shore") (collectively, "GE").[1] On May 19, 1995, after a

---

[1] The complaint also named as defendants Hitachi LTD, Hitachi Medical Corporation, Hitachi Medical Systems America, Inc., Summit World Trade Corporation, Hitachi Medical Corporation of America, and Brookhaven Magnetic Resonance Imaging, Inc. (the "Hitachi defendants"). Upon settlement of the claims asserted against them, the Hitachi defendants were released from the action prior to trial, pursuant to Stipulation and Order of Dismissal with Prejudice dated May 18, 1995.

thirteen-day trial on liability, a jury returned a verdict in favor of plaintiffs wherein it found that the two patents in suit were not invalid and infringed. On May 26, 1995, after hearing three days of testimony on damages, the same jury awarded plaintiffs $110,575,000. Presently before the Court is GE's motion, pursuant to Fed. R. Civ. P. 50 and 59, for judgment as a matter of law ("JMOL") and, in the alternative, for a new trial.

1. THE '832 PATENT

A. *Background*

Fonar Corporation is the exclusive licensee of U.S. Patent No. 3,789,832 (the " '832 patent"), entitled "Apparatus and Method for Detecting Cancer in Tissue," issued February 5, 1974 to Damadian, on application filed March 17, 1972. The method by which cancer may be detected, as claimed by the '832 patent, employs the use of nuclear magnetic resonance ("NMR" or "MR"). Some technological background is necessary.[2]

Nuclei in the body's atoms generate magnetic fields at varying energy levels. Under normal conditions, the north and south poles of the body's nuclei point in various directions. When placed in an external magnetic field, however, nuclei align with or against the direction of the external field depending on the degree of their own magnetic strength—nuclei in a low-energy state align with the external field; those in a high-energy state point away from the field. Exposure to an external magnetic field also causes nuclei to wobble, or precess, as they spin on their own axes.

---

[2] The following discussion on NMR technology is based on the testimony of Robert G. Peyster, M.D. ("Peyster"), an independent expert appointed by the Court with the parties' consent. Also with the parties' consent, Peyster's testimony was evidence in the instant case.

A radio frequency ("RF") wave, when pulsed into a body exposed to an external magnetic field, produces two effects in nuclei: first, the RF energy causes low-energy nuclei to flip into a high-energy state and align in a direction opposite to the magnetic field; second, it causes nuclei to precess in synch, or "in phase." When the RF pulse is eliminated, the effected nuclei return to their natural magnetic state. This is called "relaxation." Relaxation is quick, but not instantaneous.

During relaxation, effected nuclei emit a detectable RF signal of their own as they return to their low energy state. Their signal comprises three elements. First, the strength of the signal depends on the number of nuclei that flipped into high energy state when the RF pulse was turned on. This element is called proton density. Second, the strength of the signal depends on the rate at which the effected nuclei return to their low energy state, or, to use the proper term, the rate at which they achieve "spin-lattice" relaxation. This time is specified by "T_1". The last element effecting the strength of the emitted signal is the rate at which the effected nuclei loose "phase" among their respective wobbles, or, achieve "spin-spin" relaxation. This time is specified by "T_2".

Trial testimony revealed that, in 1970, Damadian conducted research to test his theory that T_1 and T_2 relaxation times were different in healthy and diseased tissue of the same tissue type. After obtaining encouraging results, Damadian applied for and obtained the '832 patent. Claims 1 and 2 of the '832 patent read:

1. A method for detecting cancer comprising:

a. measuring and establishing standard NMR spin-lattice relexation times and spin-spin relaxation times for both normal and cancerous tissue of the type under analysis using as an indicator nuclei at least one nuclei which exhibits deviant behavior in cancerous tissue;

b. measuring the NMR spin-lattice relexation times and spin-spin relaxation times for the suspected tissue to determine the extent of deviant behavior of the indicator nuclei; and

c. comparing the values obtained in (b) against the standards obtained in (a).

2. The method of claim 1, wherein the indicator nuclei are cell water protons.

In the instant action, Fonar alleged that, between September 1986 and February 3, 1991, GE infringed or induced infringement of Claim 1 and dependent Claim 2 of the '832 patent by the manufacture, use, and/or sale of magnetic resonance imaging ("MRI") scanners.

MRI scanners read the RF signal emitted from nuclei during relaxation and produce an image therefrom. The image represents a view of a slice of the body at a particular point along a particular plane. The scanner selects the slice of the body to be imaged and subdivides it into tiny squares of tissue, or voxels, through the use of gradient magnetic fields. After the RF pulse is introduced, the scanner's antenna collects an RF signal emitted from each voxel during relaxation. The electric signals are then converted into values to be read by a computer. For each voxel there is a corresponding pixel on an imaging screen. The computer displays the value, or RF signal strength, for each voxel as a shade of gray on the corresponding pixel. How dark or light a pixel is depends on the strength or weakness of the RF signal emitted by its corresponding voxel.

The scanner cannot produce a useful image, however, without some assistance from the operating technician. Nuclei of a given tissue type generally emit RF signals of the same strength during relaxation. As such, that tissue type should appear in the MR image as a single shade of gray. An abnormality in that tissue, however, will produce an RF signal of a different strength and a different shade

of gray on the screen. As such, a dark spot on an otherwise light image of brain tissue, for example, would indicate to a physician that there is an abnormality in the patient's brain. This being so, it is essential that the scanner obtain the maximum contrast between the varying degrees of gray. The scanner accomplishes this by repeating the gradient-RF pulse process many times. If the pulsing is done with the proper timing, the contrast will increase and the image will become sharper with every repetition. The technician sets the timing, or, pulse sequence, as it is called. This task actually involves two settings: time echo ("TE") and time to repeat ("TR"). TE and TR are called pulse protocols or timing parameters.

Fonar contended that GE infringed the '832 patent because MRI scanners manufactured and sold by GE determine whether cancer may by present in suspect tissue by comparing the T_1 or T_2 relaxation times of the suspect tissue with predetermined standard T_1 or T_2 relaxation times for normal and cancerous tissue of the same tissue type. The jury agreed, finding that GE infringed Claims 1 and 2 of the '832 patent. As to validity, the jury found that "Damadian invent[ed] the subject matter claimed by the ['832] patent." The jury awarded Fonar $35 million in damages. The Court reserved decision on GE's post-trial motion for JMOL. The instant motion for JMOL is made on renewal.

B. *Claim Construction and Infringement*

On a motion for JMOL, a district court may not disregard a jury verdict unless it is convinced that the trial record contains no evidence " 'upon which a jury might properly have returned a verdict in [the non-movant's] favor when the correct legal standard is applied,' " *Markman* v. *Westview Instruments, Inc.*, 52 F.3d 967, 975 (Fed. Cir. 1995) (en banc) (quoting *Jamesbury Corp. v. Litton Indus. Prods., Inc.*, 756 F.2d 1556, 1560 (Fed. Cir. 1985)) (emphasis omitted). "Factual findings made by the

jury in arriving at its verdict are to be upheld unless the party moving for JMOL shows that (when the correct legal standard is applied) there is not substantial evidence to support a finding in favor of the nonmovant." *Id.* (citing *Read Corp. v. Portec, Inc.*, 970 F.2d 816, 821 (Fed. Cir. 1992)). Whether the correct legal standards have been applied by the jury, either expressly or by implication, is a question considered by the district court *de novo*. *Id.* (citations omitted).

"Substantial" evidence is such relevant evidence, taken from the record as a whole, as might be accepted by a reasonable mind as adequate to support the finding under review. *Dana Corp. v. IPC Ltd. Partnership*, 860 F.2d 415, 417 (Fed. Cir. 1988), *cert. denied*, 490 U.S. 1067 (1989). In determining whether substantial evidence is present, "a court must: (1) consider all the evidence, (2) in a light most favorable to the non-mover; (3) drawing all reasonable inferences favorable to the non-mover; (4) without determining credibility of witnesses, and (5) without substituting its choice for that of the jury between conflicting elements in the evidence." *Id.* (quoting *Connell v. Sears Roebuck & Co.*, 722 F.2d 1542, 1546 (Fed. Cir. 1983)) (other citations omitted).

A jury's infringement verdict must stand where a court finds substantial evidence supporting the finding that the accused process or product performs each element of at least one of the properly construed patent claims. *See Read Corp. v. Portec, Inc.*, 970 F.2d 816, 821 (Fed. Cir. 1992). The analysis comprises two determinations: the court must define, as a matter of law, the meaning and scope of language used in the patent claims, and must also decide whether the jury's infringement verdict is supported by substantial evidence in light of the properly construed claims. *Markman*, 52 F.3d at 976, 979.[3]

---

[3] Although it is permissible under *Markman* to construe the claims on a post-verdict motion for JMOL, the Court acknowledges

It is well settled that " '[a] patent covers the invention or inventions which the court, in construing its provisions, decides that it describes and claims.' " *Id.* at 979 (quoting 3 William C. Robinson, *A Treatise on the Law of Patents for Useful Inventions* § 1019, at 247 (1890)). In defining the meaning and scope of patent claims, a district court must consider: the language of the claims; the patent's specification; and the patent's prosecution history. *Id.; Unique Concepts, Inc. v. Brown,* 939 F.2d 1558, 1561 (Fed. Cir. 1991). A court in its discretion may also consider extrinsic evidence, such as expert and inventor testimony, dictionaries, and learned treatises. *Markman,* 52 F.3d at 980. It is the language of the claims, however, that defines the scope of the invention; other evidence should be considered only insofar as it informs the court

---

that the course it has taken in this case cannot be preferred. Indeed, providing jurors with the proper interpretation *before* they deliberate makes more sense. In a perfect world, the Court would have included a definition of the claims in its charge.

The subject matter underlying this case, however, was exceedingly complex. The Court endeavored for months to enlist the assistance of an independent expert. The parties would not consent because, by their estimation, nearly every expert in the field was linked in some capacity to one of the parties. On the eve of trial the parties did consent to having Peyster read a pre-approved, joint statement to the jury regarding MRI technology and United States Patent and Trademark Office procedure.

Also on the eve of trial, the *Markman* decision came down from the United States Court of Appeals for the Federal Circuit. If the *Markman* decision had been rendered earlier, the Court would have insisted on having expert assistance from the outset. Only then would it have been possible for the Court to acquire a complete understanding of the technologies involved in time to charge the jury with a construction of the claims.

As much as it might have seemed the more logical course, it would neither have been wise nor proper for the Court to instruct the jury as to the meaning of the claims on short notice. A task of such grave importance must be undertaken after long and careful review. The Court determined that it was best to reserve claim construction until that time.

as to the meaning of those words. The words of the claims should be given their ordinary meaning; for a word to take on some special meaning, it must be defined as such in the specification. *See id.* at 979-80 (citing *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1388 (Fed. Cir. 1992)). In this sense, the specification serves as "a sort of dictionary, which explains the invention." *Id.*

Element (a) of Claim 1 of the '832 patent identifies the first step for cancer detection as the "measuring and establishing [of] standard NMR [T_1] relaxation times and [T_2] relaxation times for both normal and cancerous tissue." Element (a) claims not merely the measurement and establishment of any data for T_1 and T_2, but limits the invention to the measurement and establishment of data suitable for serving as a "standard." Given the comparison required by element (c), the word "standard" in (a) is a significant limitation. Having read the claims, specification, and prosecution history of the '832 patent, and having heard the testimony of Damadian, the inventor, and Reuben Mezrich, GE's claim interpretation expert, the Court interprets "standard" to mean NMR relaxation time data against which other data may be compared in order to detect cancer. Element (b) defines what the "other" data must be. Element (c) requires that the detection of cancer be performed by a comparison of "the values obtained in (b) against the standards obtained in (a)." As the specification aptly summarizes, at column 2, lines 22-26, Claim 1 of the '832 patent disclose a process for determining whether cancer is present "[b]y comparing the relaxation times for [suspect] tissue with relaxation times obtained for known normal tissue and known cancerous tissue."

GE's principal argument on its motion for JMOL is that the properly construed claims of the '832 patent do not read on the process of imaging. GE contends that its scanners do not infringe the '832 patent because they merely

produce images that can be analyzed by physicians in order to determine whether internal tissues contain abnormalities. If cancer can be detected, GE argues, the detection is performed by the physician, not the scanner. Even under a broad reading of the claims, GE insists, the '832 patent does not contemplate the process of imaging. Indeed, the words "image" or "imaging" appear nowhere in the claim language or specification.

Fonar would agree that, under GE's understanding of the process, the claims of the '832 patent do not read on imaging. But Fonar offers a different explanation for how cancer is detected by MRI scanners made and sold by GE. Under Fonar's theory, the scanner does the detection, and it does so by comparing the relaxation times of suspect tissue against standard relaxation times for normal and cancerous tissue. This process, Fonar argues, comes squarely within the scope of the properly construed claims.

In order to establish that GE performed element (a) of the '832 patent, Fonar had to prove that GE measured and established standards—that is, T_1 and T_2 relaxation time data for normal and cancerous tissue against which other data could be compared in order to achieve cancer detection. Fonar's theory, as presented mainly through the testimony of Damadian, is as follows. GE's scanners are able to detect cancer in a given tissue type only when they are properly calibrated for that tissue type. Proper calibration is achieved only by using an optimal pulse sequence—that is, the pulse protocol settings (TE and TR) that provide maximum differential in pixel brightness. Proper TE and TR settings for a given tissue type can be determined only by way of mathematical formulae, within which the only variables are "standard" T_1 and T_2 relaxation times for normal and cancerous tissue. The standards—numerical values—vary depending on the type of tissue under examination. In sum, Fonar contends that a useful image cannot be obtained without an optimal pulse sequence, and that an optimal pulse sequence can-

not be obtained without knowing the "standard" values for that tissue type.

Fonar identifies several documents in evidence in support of the proposition that GE measured and established standards, and, thereby, performed step (a) of Claim 1. The first is the back cover of a scientific journal, which contained an article written by GE's Manager of NMR Applications, Felix W. Wehrli. The article contains the following language: "Once detailed knowledge of T_1 and T_2 data exists for various tissue types (primarily normal and diseased), pathology-specific scan protocols can be established. This is one goal of General Electric's extensive applications development program." Pl. Exh. 612. The second is a 1987 article detailing the results of five years of GE research. Authored by GE scientists Paul A. Bottomley ("Bottomley") *et al.*, the article includes a table of "relaxation times for different pathologies and their dependence on NMR frequency, tissue of origin, temperature, and species." Pl. Exh. 599, at 2. The article states: "Such information can be used for optimizing image contrast between normal and pathological tissue via appropriate adjustment of pulse sequence timing parameters, and may be of diagnostic value." *Id.* The article also referred to a precursor work, co-authored by Bottomley in 1984, which reviewed "normal tissue relaxation." *Id.* at 1. Fonar contends, based on this evidence, that GE measured and established standards.

The evidence strongly supports the proposition that Bottomley's findings constitute essential ingredients in the process of optimizing pulse sequences. The evidence also suggests that optimal TE and TR settings are essential to the production of a useful MR image, an image that undeniably helps physicians determine whether cancer is present in tissue. But, in order for Bottomley's figures to constitute "standards," as the Court has construed that term, his data must be suitable for comparison against other data so as to form a basis for cancer detection.

Comparisons occur during the course of an MR scan. In a T_2-weighted image of brain tissue, for example, there is the comparison on the screen between light gray, indicating normal tissue, and dark gray, indicating diseased tissue. In a sense, the scanner's computer compares the RF signal it receives from a particular voxel against its internal programming in order to determine the signal's strength and set the appropriate brightness for the corresponding pixel. It cannot be said, however, that the scanner compares T_1 and T_2 relaxation times for the tissue under examination against "standard" T_1 and T_2 relaxation times for normal and cancerous tissue in order to produce an image useful for cancer detection. The image is a reflection, nearly a direct reflection, of T_1 and T_2 relaxation times for the tissue under examination. It is an indication, not a comparison. Bottomley's research provides for a more precise indication; it does not, however, provide the basis for a comparison.

A similar, but not the same, conclusion was reached several years ago in *Fonar Corp. v. Johnson & Johnson*, 630 F. Supp. 581 (D. Mass. 1986), *aff'd*, 821 F.2d 627 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 1027 (1988). In *Johnson & Johnson*, a jury verdict of infringement of Claims 1 and 2 of the '832 patent was disregarded by the district court on the defendants' motion for JMOL because "the revealing comparison [was] not between T_1 and T_2 values for suspected tissue of a particular type . . . , on the one hand, and standard values, on the other hand." *Id.* at 585. The district court found Fonar's argument that the requisite comparison existed between imaged values presented on a screen and "standard" imaged values stored in a physician's memory to be "wholly beyond the scope of any permissible interpretation." *Id.* at 586-87. The district court noted, however, that although the evidence had not supported the proposition that "accumulated scientific knowledge about T_1 and T_2 values for various types of tissue [was] sufficient . . . to enable anyone . . . to prepare a set of standards" as contemplated

by the '832 patent, "[a]n optimist may hope that it will yet be possible." *Id.* at 587-88. Fonar's theory in the instant case, therefore, was that Bottomley and GE had turned that possibility into a reality.

Because its theory of infringement was different, the evidence presented by Fonar in the instant case differed significantly from that presented in *Johnson & Johnson.* Although tempting, it would have been improper under these circumstances for the Court to grant GE's pre-trial motions on collateral estoppel grounds. In retrospect, however, it is fair to categorize Fonar's argument to the Court in the instant case as a valiant effort to fit a different square peg into the same round hole. Again, it failed to establish the existence of standard T_1 and T_2 values as contemplated by Damadian. As such, the Court determines, as a matter of law, that the infringement verdict returned by the jury is not supported by substantial evidence. GE's scanners do not detect cancer by the comparison method disclosed by Claims 1 and 2 of the '832 patent. The motion for JMOL is granted on the ground that GE's scanners do not infringe Claims 1 and 2 of the '832 patent as construed by the Court. In doing so, the Court must disregard the jury's answers to question I.A. on the Verdict Sheet.[4]

C. *Invalidity*

Pursuant to 35 U.S.C. § 282, a patent is presumed valid. A party challenging this presumption, must prove by clear and convincing evidence that the patent is invalid. *North Am. Vaccine v. American Cyanamid Co.*, 7 F.3d 1571, 1579 (Fed. Cir. 1993), *cert. denied,* 114 S. Ct. 1645

[4] Indeed, the Court could have granted GE's motion for JMOL at the close of Fonar's case on the ground that the properly construed claims did not read on imaging as performed by GE's scanners, but the Court determined that the safer course was to allow all evidence to be presented and all arguments to be made before rendering an interpretation of the claims.

(1994). On motion for JMOL, the Court analyzes invalidity issues submitted to the jury by the same standards used for infringement—that is, (1) whether there is substantial evidence supporting the jury's express or implied findings of fact and (2) whether those findings are legally sufficient to support the legal conclusion drawn by the jury in reaching its verdict. *See Dana Corp.*, 860 F.2d at 417.

The Court concludes that there is substantial evidence in the record supporting the jury's finding that the '832 patent was not procured through inequitable conduct. In addition, the Court determines that, based on the evidence presented by GE, a reasonable jury could find no set of facts upon which an obviousness determination could be based. As such, GE failed to sustain its burden of proving, by clear and convincing evidence, that Claims 1 and 2 of the '832 are invalid. Accordingly, the motion for JMOL is denied in this respect.

II. THE '966 PATENT

A. *Background*

Fonar Corporation is the exclusive licensee of U.S. Patent No. 4,871,966 (the "'966 patent"), entitled "Apparatus and Method for Multiple Angle Oblique Magnetic Resonance Imaging," issued October 3, 1989 to Stanton D. Smith ("Smith"), David Hertz ("Hertz"), Robert Wolf ("Wolf"), and Robert H. Olsen ("Olsen"), on application filed November 16, 1988. The '966 patent discloses a method and apparatus for obtaining, in the course of a single MR scan, a number of images at different angles to each other.

The imaging technique claimed by the '966 patent, called multi-angle oblique ("MAO"), is particularly useful for scanning the spine. In order to analyze spinal tissue, a physician needs images representing an axial view of each disc—that is, a picture of what each disc would

like if it were cut in half along its east-west axis. Because vertebrae join each other at a variety of angles to constitute the snake-like spine, the proper angle from which to produce an image of one disc will differ from the next. In the past, each disc was scanned separately, resetting the scanner for the appropriate angle each time. Using MAO, the scanner can produce images of all the discs, at desired angles, in one scan. MAO, as claimed by the '966 patent, involves the use of a "scout image." The scout image is a preliminary sagittal-slice image of the spine—that is, what the spine would look like if it were cut in half along its north-south axis. By placing cursor lines across the scout image, at each disc, the technician selects the angle from which each disc will be imaged. With the push of a button, the scanner generates axial pictures of each disc and a scout picture identifying the angles from which each axial picture was taken.

In the instant action, Fonar alleged that GE infringes or induces infringement of Claims 1, 2, 4, 5, and 12 of the '966 patent by the manufacture, use, sale, and maintenance of MRI scanners. At trial, GE defended on the following grounds: (1) that the '966 patent was invalid, pursuant to 35 U.S.C. § 112, ¶ 1, for failure to disclose "the best mode contemplated by the inventor[s] of carrying out [their] invention" and information sufficient to enable one skilled in the art to make and use the claimed invention without the necessity of undue experiment; (2) that the '966 patent was invalid, pursuant to 35 U.S.C. § 102(f), for failure to disclose all the inventors; (3) that the '966 patent was invalid, pursuant to 35 U.S.C. § 102(b), because its subject matter was in public use more than one year prior to the filing date; (4) that the '966 patent was invalid, pursuant to 35 U.S.C. § 103, because its subject matter would have been obvious to one skilled in the prior art; (5) that the '966 patent was invalid, pursuant to 35 U.S.C. § 102(g), because its subject matter was antici-

pated by the prior invention of another; and (6) that GE did not infringe or induce infringement of the '966 patent.

The jury found that GE infringed Claims 1, 2, 4, 5, and 12 of the '966 patent, and, in response to interrogatories submitted, pursuant to Fed. R. Civ. P. 49(a), on each invalidity defense, that the claims were not invalid. As to damages, the jury awarded Fonar $27,825,000 in lost profits for GE's sales of 75 MRI scanners, and $34,125,000 in reasonable royalties for GE's sales of 525 scanners. The jury also awarded Fonar $13,625,000 in damages for inducement of infringement. This last award was given in response to an interrogatory, which the Court gave based on Fonar's theory that GE's performance of maintenance and repair after notice of infringement on scanners sold prior to notice of infringement constituted inducement of infringement.

GE moved for JMOL on numerous grounds at the close of the proceedings. The Court denied the motions on all grounds except failure to prove inducement of infringement, a ground upon which the Court reserved decision. GE has renewed its motion on every ground—twenty-three to be exact. The motion is summarily denied as to all grounds not specifically addressed by the Court in this Memorandum & Order.

B. *Claim Construction*

As stated above, it is the obligation of the Court to render an interpretation of the claims of the patent-in-suit. The full text of the claims at issue are set forth in the Appendix to this Memorandum & Order.

Claim 4 and dependent Claim 5 contain "means-plus-function" language. Claims with means-plus-function language "cover the corresponding structure, material, or acts described in the specification and equivalents thereof." 35 U.S C. § 112; *King Instruments Corp. v. Perego,* Nos. 91 Civ. 1125 and 91 Civ. 1132, 1995 WL 555087, at *3

(Fed. Cir. Sept. 19, 1995). This rule of construction applies whether the claim language is being construed in the context of an infringement or invalidity determination. *In re Donaldson*, 16 F.3d 1189, 1193 (Fed. Cir. 1994).

Element (a) of Claim 4 covers: "positioning an object in an NMR imaging apparatus which includes . . . means for producing an image from said NMR imaging data." Element (b) covers: "operating said NMR imaging apparatus to obtain NMR scout image for a portion of said object." Element (c) covers: "using said scout image to select a first plane and a second plane of said object for which NMR imaging data is to be obtained." Read in conjunction with its preceding elements, element (c) limits the invention in the following respect: each of the multiple angles at which images are to be obtained must be "select[ed]" by "using" a "scout image."

The specification of the '966 patent makes two references to the phrase "scout image." It states in column 3, lines 29-35, that a scout image is an image of a "portion of the object of the examination. . . . used to select" planes from which "NMR image data is to be obtained." It also states, in column 16, lines 53-57:

> Referring to FIG. 10, a particular medical use of the apparatus of the present invention is depicted. A patient is disposed in an NMR imaging apparatus, and a scout scan is taken of the patient's spine, which is displayed on a screen 130.

The Court construes the phrase "scout image" to mean a preliminary NMR image of a portion of the object of the examination used for the purpose of "select[ing]" desired imaging planes. In so construing, the Court declines to limit the phrase "scout image" to preliminary images of the spine. *See Electro Med. Sys. S.A. v. Cooper Life Sciences*, 34 F.3d 1048, 1054 (Fed. Cir. 1994) (cautioning that "although the specification may well indicate that

certain embodiments are preferred particular embodiments appearing in the specification will not be read into the claims when the claim language is broader than such embodiments").

The limitation also requires that the desired imaging planes be "select[ed]," by "using" the scout image. These words identify the method by which the imaging angles must be selected. Figures 5 and 10, and corresponding text in the specification, show quite clearly that the manual use of cursor lines on the scout image are the method for selecting imaging planes. The specification does indicate that "direct input" of desired imaging planes "suffices for the purposes of the present invention," *see* '966 patent, col. 15, lines 39-42, but because Claim 4 is limited by its own language to use of a "scout image," direct input of desired imaging planes is not covered by Claim 4. *See In re Donaldson*, 16 F.3d at 1195. The Court determines that Claim 4 covers the manual use of cursor lines on a scout image to select desired imaging angles.

Claim 1 and dependent Claim 2, however, are not limited to use of a "scout image." As such, the Court determines that direct input of desired imaging planes is covered by Claim 1.

C. *Invalidity*

As indicated above, a party challenging the presumption that a patent is valid, must prove by clear and convincing evidence that the patent is invalid. *North Am. Vaccine*, 7 F.3d at 1579. Based on its responses to interrogatories, the jury found that GE failed to prove that the '966 patent was invalid. GE moves for JMOL on several grounds. The verdict must stand, however, unless GE establishes that the jury's express or implied findings of fact are not supported by substantial evidence or that those findings are insufficient to support the legal conclusion drawn by the jury in reaching its verdict. *See Dana Corp.*, 860 F.2d at 417.

1. *Best Mode*

GE argues that the '966 patent is invalid because its inventors contemplated a best mode for carrying out Claims 1, 2, 4, 5 and 12 which they did not adequately disclose. The first paragraph of 35 U.S.C. § 112 sets forth the requirement that the patent specification "set forth the best mode contemplated by the inventor of carrying out his invention." Best mode analysis has two components. *In re Hayes Microcomputer Prods. Patent Litig.*, 982 F.2d 1527, 1536 (Fed. Cir. 1992) (citing *Chemcast Corp. v. Arco Indus. Corp.*, 913 F.2d 923, 927 (Fed. Cir. 1990)).

> The first inquiry focuses on whether the inventor knew of a mode of practicing his invention at the time he filed his patent application which he considered to be better than any other. This determination is subjective, focusing on the inventor's state of mind at the time he filed his application. If he did have a best mode, the next question is whether he disclosed it and did so adequately to enable one of ordinary skill in the art to practice the best mode. This is an objective determination. There must be no concealment of a mode known by the inventor to be better than that which is disclosed.

Id. (citing *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384-85 (Fed. Cir. 1986), *cert. denied*, 480 U.S. 947 (1987)). Whether the best mode requirement has been met is a question of fact. *Id.*

GE asserts that, at the time the inventors filed the patent application, the inventors knew that certain computer hardware and software were better than any other for implementing MAO, as claimed by the '966 patent. GE argues that the inventors' bare functional disclosure in the '966 patent effectively concealed their best mode. Fonar acknowledges that the inventors contemplated particular hardware and software as part of their best mode for implementing MAO, but contends that the jury ver-

dict is supported by substantial evidence because this mode was adequately disclosed in the '966 patent.[5]

In discussing the best mode requirement in a case where the patent-in-suit did not disclose a specific computer program used to implement a system for converting a seismic time section, the United States Court of Customs and Patent Appeals stated:

> In general, writing a computer program may be a task requiring the most sublime of the inventive faculty or it may require the droning use of clerical skill. The difference between the two extremes lies in the creation of mathematical methodology to bridge the gap between the information one starts with (the "input") and the information that is desired (the "output"). . . .

In re Sherwood, 613 F.2d 809, 817 (C.C.P.A. 1980), *cert. denied*, 450 U.S. 994 (1981). Continuing, the court in *Sherwood* held:

> [Because the] specification provides the general mathematical equations used and teaches the further "trick" of chopping the physical input seismic traces into segments via a mathematical manipulation, ... [it] delineates the best mode in a manner sufficient to require only the application of routine skill to produce a workable digital computer program.

---

[5] Even though, having reviewed the evidence, the Court does not find strong support for the proposition that GE proved, by clear and convincing evidence, that the inventors on the '966 patent did, in fact, contemplate a *best* mode for carrying out their invention at the time of filing, the Court treats the following language from Fonar's memorandum of law submitted in opposition to GE's motion for JMOL as an acknowledgement that a best mode was contemplated. The language is: "[t]he evidence makes clear that at the time the application for the MAO patent was filed, Fonar went to great lengths to disclose the best mode it knew." Pl. Mem., at 23.

Id. In fact, disclosure of merely the general function of hardware and software necessary for implementation of an invention can satisfy the best mode requirement. *See In re Hayes*, 982 F.2d at 1537.

In order to perform MAO—that is, to generate multiple images at different orientations during the course of a single scan—an MRI scanner must have the capacity, among other things, to simultaneously launch two gradient waveforms towards each other from transverse angles. It must also be able to assign each gradient a different frequency. When the gradients collide, a new, hybrid gradient is created along a new, oblique-angle plane. The strength chosen for each of the initial gradients determines the exact angle of the hybrid gradient. As Wolf, one of the inventors on the '966 patent, explained at trial, it is "like turning on the hot and cold water at the same time to get the warm water, [only] now we're mixing the two power supplies." Trial Tr. at 484. This process is called rotating gradients.

The inventors on the '966 patent believed that gradient rotation could best be accomplished with hardware that they called a "gradient multiplier board" ("GMB"). The GMB was engineered by Hertz. On his direct examination, the following colloquy took place between Hertz and Fonar's counsel:

> Q. Now was this board disclosed in the ['966] patent?
>
> A. Yes, it was.
>
> Q. And is it called the gradient multiplier board on Fonar, (sic)?
>
> A. That's correct.
>
> . . . .
>
> Q. And would you show the ladies and gentlemen of the jury where . . . on figure seven [of the '966

> patent], there is a blocked diagram of the gradient multiplier board?
>
> A. The area on the dotted line.
>
> Q. And in the—within that dotted line and in the description of the patent does it tell the person of ordinary skill in the art everything they need to know in order to build a gradient multiplier board that will operate on a general MRI system?
>
> A. Yes, it does. It is black dark art (sic) that will include all the functions that will be needed.
>
> Q. And is there then a written description . . . in the body of the patent that goes along with those functions?
>
> A. Yes, there is.

Trial Tr. at 640-41.

The specification discloses that the GMB comprises six principal components—an arithmetic unit, a multiplier and offset parameter RAM, a slice pointer, a level pointer, and two terminals, *see* '966 Patent, fig. 7—and describes how they interact during the course of a MAO scan. For example, it states that: "[t]he slice pointer 31, in response to a pulse from the pulse programmer 24, outputs a signal to the RAM 28," *id.* at col. 13, lines 1-3; "[t]he waveform data and the axis signal are conveyed to the arithmetic unit 25, and the axis signal is conveyed to the multiplier and offset parameter RAM 28," *id.* at col. 13, lines 25-28; "the RAM 28 outputs the above-described multiplier and offset terms," *id.* at col. 13, lines 35-36. More specifically, the specification describes how the GMB generates a gradient waveform at the desired strength:

> [f]or an input from the slice pointer 31 indicating the second slice, and an input from the generator 20 indicating the Z axis, the RAM 28 outputs the multiplier [COS(d) + SIN(d)]C_{zz}, and outputs the offset A[COS(d) – SIN(d)]C_{zz}. The arithmetic unit 25

> multiplies the digital data representing the generic waveform G(t) by the multiplier term and to this expression adds the offset term. The sum, which represents the waveform segment to be applied to the Z coil, is output in digital form from terminal 41, and a signal indicating the corresponding Z axis is output from the terminal 32.

Id. at col. 13, lines 37-47.

The testimony of Smith, the lead inventor on the '966 patent, supports the sufficiency of the disclosure. After identifying one of the "benefits" of the GMB as its capacity to allow "the scanner to go through the entire data acquisition process without ever talking to the host computer for that purpose," the following colloquy took place between Smith and counsel for GE:

> Q. Does [the '966 patent] tell you how to do it?
>
> A. I think it shows essentially how these parameters are stored in the multiplier and offset parameter RAM, and it shows there is an arithmetic you want which does the calculations and there is some reference to that whole process there.
>
> There [are] some equations that show, for example, how two gradients may be combined arithmetically. That particular equation describes [the] kind of calculation that leads to rotation of a plane.
>
> . . . .
>
> . . . I think I would say yes to your question.

Trial Tr. at 1264-66. Smith's testimony is particularly probative given the fact that he was the only inventor not employed by Fonar at the time of trial, and that he was called as GE's witness. That and other evidence supports the conclusion that a person of ordinary skill in the relevant art could engineer a GMB based on the information provided in the '966 patent. *See In re Hayes*, 982 F.2d at 1537-39.

GE, nonetheless, argues that the best mode was not disclosed because the '966 patent makes no reference to the existence or appropriate function of "comparators," which, according to Hertz, exist on the GMB for interaction with power supplies. Indeed, Hertz testified on cross-examination that the comparators were "very important"; he referred to them, in fact, as the "trick" of the invention. *See* Trial Tr. at 677-78. On redirect, however, he testified as follows:

> Q. Are [comparators] necessary on every MRI machine?
>
> A. No, they are not.
>
> . . . .
>
> Q. If someone is using an MRI machine that requires a comparator, will they be able to find out that they have to put a comparator in when they build the multi-angle oblique invention from reading the patent?
>
> A. I believe that a skilled engineer will have the ability to understand it.

Id. at 689. Even if the cross-examination testimony of Hertz establishes that the inventors contemplated the use of comparators as part of the best mode of practicing their invention, his testimony on redirect makes clear that best mode was adequately disclosed without reference to comparators. As such, the Court determines that substantial evidence supports the jury's implied finding that the GMB board was adequately disclosed in the '966 patent.

GE also contends that the inventors failed to adequately disclose information necessary to write the software for the MAO invention. MAO requires two types of software. One type, which is generally referred to as a "device driver," allows the host computer to exercise and operate hardware that is external to the computer—that is, the GMB. Wolf, after reviewing a stack of GMB specifications given to him by Hertz, developed two device driver

subroutines. The other type of software, written by Olsen, allows the scanner technician to choose imaging slices on the scout image. Based on the chosen slices, his program calculates and communicates the appropriate parameters to Wolf's device drivers, which, in turn, run the GMB. This type of software is called a "user interface" or "graphic prescription." GE contends that the inventors failed to meet the best mode requirement because the '966 patent disclosed neither the specifications for the software itself nor the GMB specifications necessary to write the device driver subroutines.

The flaw in GE's argument is apparent from the following testimony given by Wolf:

> Q. From that written description [of the GMB in the '966 patent], is there sufficient description to a software engineer, such as yourself, of what software needs to be written in order to perform the multi-angle oblique invention?
>
> A. Yes.
>
> . . . .
>
> Q. In any event, the software, itself, as we see in the hundred pages of Exhibit 816, is not reproduced in the patent.
>
> Is that right?
>
> A. That is correct.
>
> Q. Why is that?
>
> A. For a few reasons.
>
> First of all, it's large . . . .
>
> What's much more important is to have a description of what the software has to do, and that is what you will find in the patent.

Id. at 508-10. As an example, Wolf explained that the specification teaches "how the computer can calculate the

various frequencies for each slice for each angle based on the strength of the slice of the gradient when its rotated to the angle of the slice." *Id.* at 628 (referring to '966 patent, col. 12, lines 16-23[6]). The language identified, according to Wolf's testimony, "tells someone what to base the calculations on for the RF frequencies." *Id.* at 629.

The evidence supports the conclusion that a software engineer of ordinary skill could design sofeware sufficient to run hardware capable of performing the invention claimed by the '966 patent. *See In re Hayes*, 982 F.2d at 1537-39.

The Court determines that there is substantial evidence supporting the jury's finding that GE failed to prove, by clear and convincing evidence, that the best mode requirement was not violated.[7]

2. *Enablement*

GE also contends that the Claims 1, 2, 4, 5, and 12 are invalid because the disclosure in the '966 patent was insufficient to enable one skilled in the art to make and use the invention. The first paragraph of 35 U.S.C. § 112 contains a second disclosure requirement that is separate and distinct from best mode. It mandates that the specifi-

---

[6] The full text to which Wolf refers reads: "Further, in response to the coordinate and angle data associated with each slice output by the system 70, the computer 71 calculates for each slice an RF excitation frequency for the plane orthogonal to the direction of the slice selector gradient rotated by the angle of the slice, which passes through the selected portion of the object, and a frequency required to demodulate the corresponding NMR signal during the read out period."

[7] GE's claim that the best mode requirement is violated merely because Fonar maintains as trade secrets certain aspects of the hardware and software has no merit. *See, e.g., In re Hayes*, 982 F.2d at 1538 (holding that best mode was adequately disclosed even where a patentee held as a trade secret the fact that a particular implementation of his invention was in firmware).

cation contain a written description of the claimed invention sufficient to enable any person skilled in the art to which the invention pertains to make and use that invention. Although not explicitly stated in § 112, to be enabling, the specification must teach those skilled in the art how to make and use the full scope of the claimed invention without "undue experimentation." *In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993). Nothing more than an objective enablement is required, however; it is irrelevant whether the teaching is provided through broad terminology or illustrative examples. *Id.* (citing *In re Marzocchi*, 439 F.2d 220, 223 (C.C.P.A. 1971)).

Enablement is a question of law, supported by underlying factual determinations. *See Quaker City Gear Works, Inc. v. Skil Corp.*, 747 F.2d 1446, 1453-54 (Fed. Cir. 1984), *cert. denied*, 471 U.S. 1136 (1985). A court may submit legal issues such as enablement to the jury, pursuant to Fed. R. Civ. P. 49(a), but if it does, "the court may not make subsequent findings which overrule an implicit and inherent finding of the jury." *Id.*

The jury responded in the affirmative to an interrogatory asking whether the description in the '966 patent was sufficient to enable one skilled in the art to make and use the subject matter of Claims 1, 2, 4, 5, and 12. Implicit therein is the jury's factual determination that skilled engineers could make and use the full scope of the invention without unreasonable experimentation. GE asserts that, given the disclosure in the '966 patent, a skilled engineer would not be able to build the MAO invention in less than one to three years. GE's assertion, however, is supported by no more than its witnesses' conclusory oral testimony that the hardware and software specifications were insufficiently disclosed. As discussed above, ample evidence supports the conclusion that the inventors disclosure was adequate in this regard.

The record supports the jury's implied conclusion that one skilled in the art could build the invention without

undue experimentation. The Court determines, as a matter of law, that the description of the invention in the '966 patent is enabling.

3. *Anticipation: The Work of Hattes*

A patent may be invalid as anticipated pursuant to 35 U.S.C. § 102(g) where there is prior conception and reduction to practice by another of the patentee's invention. *See Texas Instruments, Inc. v. United States Int'l Trade Comm'n*, 988 F.2d 1165, 1177 (Fed. Cir. 1993). Although anticipation is a question of fact, conception and reduction to practice are questions of law. *See Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1376, 1379 (Fed. Cir. 1986), *cert. denied*, 480 U.S. 947 (1987).

GE argues that its scientists were first to invent the subject matter of Claims 1, 2, 4, 5, and 12 of the '966 patent. "Priority goes to the first party to reduce the invention to practice unless the other party can show that it was the first to conceive the invention and that it exercised reasonable diligence in later reducing that invention to practice." *Price v. Symsek*, 988 F.2d 1187, 1190 (Fed. Cir. 1993). Conception is the " 'formulation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice.' " *Id.* (quoting 1 *Robinson on Patents* 532 (1890)). Reduction to practice requires that the claimed invention work for its intended purpose. *Id.* It is undisputed that the inventors on the '966 patent reduced their invention to practice in November 1985. GE acknowledges that it did not reduce MAO to practice before Fonar. Therefore, in order to establish invalidity by anticipation, GE had to prove, by clear and convincing evidence, that it conceived the subject matter of the '966 patent prior to November 1985, and, if so, that it exercised reasonable diligence until the time when it ultimately reduced the process to practice.

GE contends that, in April 1983, scientist Neil Hattes ("Hattes") conceived GE's MAO technique—the process upon which Fonar's infringement charge is based. On direct examination, Hattes described a March 1983 entry in his notebook, which he had labeled "problem of oblique planes," as his "initial statement of proposals, of ways that oblique plane imaging could be accomplished in a scan." Trial Tr. at 1376. Next, he described a January 1984 entry in the same notebook, labeled "oblique plane musings," as representing his "continuing thinking about more details about how we would build, what type of hardware would it take to perform the rotation." *Id.* at 1382. Clearly such "proposals" and "musings" fall short of establishing conception.

Hattes also explained how he learned of a Texas Instruments microprocessor that could perform arithmetic at a high rate of speed, and how, in August 1984, he assigned to a GE engineer named Steven Deutsch ("Deutsch") the task of "flushing out the design concept" for a board capable of performing a scan at an oblique angle. *Id.* at 1386-87. In November 1984, Deutsch finished an unpublished work, entitled "Microprocessing Implementation of MR Oblique Plane Imaging," Def't Exh. 366. The Deutsch paper advised that certain software would be necessary "to accommodate multi-slice imaging where each slice may have a different orientation." *Id.* It also found it necessary for such software "to provide an operator interface so that image rotation can be conveniently specified," but indicated that the "details" of changes to GE's existing MRI software were "beyond the scope of this report." *Id.* Both Hattes and Deutsch testified that the Deutsch paper describes in detail a device for doing MAO. Trial Tr. at 1397-98, 1418-19.

Continuing on direct examination, Hattes testified that he assigned another GE engineer the task of designing hardware based on the Deutsch paper. What GE calls an Oblique Plane Imaging ("OPI") board was completed

January 1985. *Id.* at 1399. By February 1985, according to Hattes's testimony, GE had the capacity to perform MAO by using the OPI board in conjunction with a dip-switch, a device used by the operator to select multiple imaging angles during the course of a single. *Id.* at 1403.

Evidence clearly establishes, however, that GE had not reduced MAO to practice in February 1985; in fact, it had yet to begin work on either the device driver or user interface software. An internal memorandum, entitled "Oblique Plane Imaging: An Initial Report," which was prepared by Hattes for GE management in August 1985, listed "objectives" of GE's "oblique plane imaging plan" followed by this text:

> Future improvements may include:
>
> • Multi-Angle, multi-slice (spine tracking)

Pl. Exh. 83. Indeed, Hattes's use of the word "may" raises serious doubt as to whether he, or anyone else at GE, possessed in August 1985 a "definite and permanent idea of the complete and operative" MAO invention, as it would later be reduced to practice.

Nonetheless, GE insists that its scientists had conceived the MAO invention before August 1985. It proclaims that the Deutsch paper "set out a complete conception of GE's multislice, multiangle imaging technique in November 1984." Def't Mem. in Supp. of JMOL, at 16. "[A]ll that remained for GE's commercial product was . . . the routine software for interfacing with the hardware and to integrate it into the machine." *Id.* at 17. Other than the oral testimony of GE's own employees, GE did not present evidence supporting the notion that it had undertaken even preliminary work on the necessary software before November 1985, the date Fonar undeniably reduced to practice. Indeed, the outline of a presentation given by the lead software designer on February 17, 1986 indicates that GE still considered it an "objective" at that time to:

- Acheive (sic) Parity with Competitors

  —Seimens has single angle about primary axis.

  —Technicare has three angles prescription.

  —Fonar allows each slice in a multi-slice to have its own angle.

Pl. Exh. 65.

Moreover, the evidence falls short of establishing that GE's OPI board was in fact a complete embodiment of the hardware necessary to perform MAO. Hattes acknowledged, on cross examination, that OPI modification would be necessary once the software was complete. Trial Tr. at 1472.

The Court determines that an inventor must have done at least some of the preliminary calculations necessary to design the proper software before he can claim to have "conceived" the subject matter of Claims 1, 2, 4, 5, or 12. For Claims 4 and 5, work must have been commenced on both the device driver and the user interface; for Claims 1 and 2, work must have been commenced on the device driver. The proof falls short of establishing that any software work was performed before November 1985.

The Court notes, however, that even if MAO was conceived by Hattes/Deutsch, GE failed to exercise reasonable diligence between the time of conception and the time of reduction to practice. GE suggests that MAO was conceived in November 1984, the time of the Deutsch paper, but GE admittedly did not reduce the invention to practice until September of 1986. GE should have been able to write the "routine" software—"all that remained for GE's commercial product"—in less than twenty-two months.

The Court determines, as a matter of law, that GE was not the first to conceive the MAO technique, and that, even if it was, it failed to exercise reasonable diligence between conception and reduction to practice. There is

substantial evidence in the record supporting the jury's conclusion that GE failed to prove, by clear and convincing evidence, that the claims of the '966 patent were anticipated by the work of Hattes *et al.*[8]

4. *Anticipation: The Work of Glover*

GE asserts that Claims 4 and 5 of the '966 patent are invalid because they were anticipated by the work of GE scientist Gary Glover, as memoralized by his report, published by GE in October 1984 (the "Glover reference"). *See* Def't Exh. 1222. A patent can be invalid as "anticipated" pursuant to 35 U.S.C. § 102(b) where the subject matter claimed by the patent was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention by the patentee.

Glover gave the following testimony at trial. *See* Trial Tr. at 1127-1151. One of his responsibilities at GE was to perform magnet shimming. Magnet shimming is the process by which magnetic strength is maintained in a uniform fashion throughout an MRI scanner's magnetic field. The tube-shaped magnet creates a magnetic field in the area inside the tube. At one time, shimming was performed by inserting wedge-shaped materials between the outside edge of the tube and its encasing. The shims would adjust the shape of the tube, and, thereby, adjust the balance of the magnetic field inside the tube. By trial

---

[8] The jury was instructed that it could find a patent invalid where the "inventor did not himself invent the subject matter sought to be patented." Trial Tr. at 1969. In addition, the jury was instructed: [i]n determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was the first to conceive and the last to reduce to practice." *Id.* In light of this instruction, the jury's affirmative response to interrogatory II.C., which asked whether "Drs. Smith, Hertz, Wolf, and Olsen, by themselves, invent[ed] the subject matter claimed," was a finding that the '966 patent was not anticipated by prior invention.

and error the field could be balanced. Glover found this process to be entirely inefficient. He devised a process to collect MR data from scans taken at four different rotations in order to compute and measure the field strength for any given point in the field. The process produced images—usually of a bottle of water placed in the exact center of the field—the varying brightness of which would indicate strength of the field at a given point. Using the images, Glover could readily determine proper shim settings. Glover memorialized the process—which he called Chemical Shift Imaging ("CSI")—in the Glover reference.

GE argues that the Glover reference anticipates Claim 4 of the '966 patent. Anticipation, as indicated above, is a question of fact. As asserted here, it requires "the presence of a single prior art disclosure of each and every element of the claimed invention." *Electro Med. Sys. S.A. v. Cooper Life Sciences*, 34 F.3d 1048, 1052 (Fed. Cir. 1994). "The mere fact that a certain thing *may result* from a given set of circumstances is insufficient to prove anticipation." *Id.* (emphasis in original). Rather, each claim limitation in the patent must necessarily be present in the prior art disclosure. *Id.*

As noted above, Claim 4 and dependent Claim 5 cover the use of manual cursor lines on a scout image to select desired imaging planes. The Glover reference neither contains the phrase scout image, nor discusses the concept of using a scout image as envisioned by Claim 4. *See* Def't Exh. 1222; Trial Tr. at 1176. On direct examination, Glover admitted that in performing CSI he "often took what we would call a scout image of what we called the bottle water to make sure it was in the right place to make sure before we did anything substantively." Trial Tr. at 1151. He also stated that he used cursor lines. The evidence establishes that the scout image used by Glover and the scout image claimed by the '966 patent are both to be used in a preliminary fashion. GE, however, did not establish that Glover used his scout scan as

a means of selecting desired imaging planes. The evidence is insufficient to support the conclusion that Claims 4 and 5 of the '966 patent are anticipated by the Glover reference, or Glover's knowledge or use of CSI. There being no evidence upon which a reasonable jury could find that GE met its burden of proof, the Court determines, as a matter of law, that the '966 patent is not invalid as anticipated by the work of Glover.

5. *Obviousness*

Even where the patented invention is not "anticipated" pursuant to § 102, it may be deemed invalid pursuant to 35 U.S.C. § 103 if the differences between the subject matter of the claimed invention and the prior art are such that the subject matter as a whole would have been "obvious" to a person of ordinary skill in the art at the time the invention was made.

Obviousness is a question of law, based on underlying factual inquiry. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1566-68 (Fed. Cir.), *cert. denied*, 481 U.S. 1052 (1987). The ultimate legal conclusion is whether the subject matter of a claimed invention would have been obvious to one skilled in the prior art. *Id.* at 1568. The factual inquiry involves consideration of the following factors set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966): (1) the scope and content of the prior art; (2) the differences between the prior art and the claims; (3) the level of ordinary skill in the art at the time of the invention; and (4) objective evidence of nonobviousness, such as long-felt but unsatisfied need, commercial success, and copying. The degree to which the obviousness question is one of fact is the "degree required to erect a foundation of facts capable of supporting the conclusion." *Panduit*, 810 F.2d at 1568. The conclusion is the legal question the court must answer: "whether the patent challenger carried its burden of establishing invalidity." *See id.* at 1569.

The jury returned negative answers as to Claims 1, 2, 4, 5, and 12 in response to an interrogatory asking whether the subject matter '966 patent would have been "obvious, in light of the prior art, to one skilled in the art at the time the invention was made. On GE's motion, the Court must determine whether there was substantial evidence upon which a reasonable jury could have found facts consistent with its conclusion of nonobviousness.

Fonar contends that only those references disclosed to the United States Patent and Trademark Office qualify as prior art for the purpose of the obviousness determination. GE insists, however, that the knowledge, work and/or devices of Hattes and Glover should be included, as well. *See* Trial Tr. at 1807. As explained below, the subject matter of the '966 patent would not have been "obvious," even if the prior art included the work of Hattes and Glover.

With the exception of the Deutsch paper, GE's evidence supporting the proposition that the Hattes conception was prior art is a collection of oral testimony from various GE personnel. Because "oral testimony to establish the existence of allegedly anticipatory devices has long been viewed with skepticism," *Sjolund v. Musland*, 847 F.2d 1573, 1578 (Fed. Cir. 1988), a reasonable jury could certainly have found that—with the exception of the Deutsch paper—the subject matter allegedly conceived by Hattes was not prior art. Assuming, *arguendo*, that the jury did consider the Deutsch paper prior art, differences between the prior art and the claims of the '966 patent would have been the software necessary to perform MAO.

As stated above, two types of software are necessary to perform MAO—device drivers and graphic prescription. As to graphic prescription, the evidence is conflicting. In support of its contention that graphic prescription was an obvious leap from the hardware, GE points to the testimony of Smith. He was questioned, as follows, about an MRI scanner that he used prior to the invention of

MAO, the various capacities of which had been disclosed in the '966 patent as prior art:

> Q. As far as using that cursor then to do multiple slices at different angles, say two slices at different angles, was that an obvious change to what you had on the machine that was there in the summer of '85, just have the cursor move from one angle to another and it would record those two angles?
>
> A. I think that was a pretty clear extension of what we were doing. That is not something we labored long over.
>
> . . . .
>
> THE COURT: Was it obvious to someone skilled in the art to go from one to various lines?
>
> A. I think in terms of the means of how to set up the positioning of the different slices it's a pretty obvious extension of how we did it.

Trial Tr. at 1270-71. Fonar, however, identifies the following testimony of Hattes in support of the contrary view:

> Q. [Graphic prescription is] a user interface. Would that be the correct way to describe it?
>
> A. It is a user interface.
>
> Q. And as used here on the image on the screen, it's the user interface that tells the computer—its the software that tells the computer which planes are to be imaged and at what angles, correct?
>
> A. Well, I think it's the start of a very complex process from the drawing to some resultant information that would lead to the scan that would then be requested.
>
> Q. Why did you call that a complex process?
>
> A. Well, I think that the interpretation of where the lines are, what that might mean in terms of what

> the system has to follow, those directions, in my mind, was not an easy follow from one to the other.

Id. at 1469-70. Although Hattes's expertise is not software design, a reasonable jury could have found him to represent one skilled in the art at the time of the invention. The same holds true for Smith, although his testimony is particularly compelling because he is an inventor on the '966 patent.

Despite Smith's testimony, the Court determines that, even if the jury considered the Deutsch reference prior art, there is substantial evidence to support factual findings that could serve as a basis for a conclusion of nonobviousness. This determination is based, not only on the testimony of Hattes, but also on GE's failure to produce evidence supporting the obviousness of device driver software. In addition, the substance of GE's best mode and enablement arguments undermine the force of its obviousness assertions. For example, GE's "patent" expert, Joseph Colaianni ("Colaianni"), testified that "the disclosure in the ['966] patent with regard to the software" was insufficient because it did not contain "a complete description of the invention so as to enable a person skilled in the art to make and use it." *Id.* at 1784. On the one hand, GE contends that one skilled in the art could not have written the necessary software because the '966 patent did not sufficiently disclose how to write it; yet, on the other hand, GE insists that to one skilled in the prior art designing the software would be "obvious." The former contention diminishes the viability of the latter. If one cannot design the necessary software based on the prior art *and* the '966 patent disclosure, it cannot then be an "obvious" task for one to design the same software based on the prior art *without* the '966 patent disclosure.

GE also makes an obviousness argument in light of Glover's work. The Glover reference, however, adds little to GE's position. Based on the jury's implied factual findings—which are supported by substantial evidence

even if both the Deutsch and the Glover references were considered prior art—the Court determines, as a matter of law, that GE failed to prove, by clear and convincing evidence, that the subject matter of Claims 1, 2, 4, 5, and 12 would have been obvious at the time of the invention to one skilled in prior art.

D. *Inducement of Infringement*

The jury found that GE infringed Claims 1, 2, 4, 5, and 12 of the '966 patent, and the Court determines, without need for discussion, that the jury's finding is supported by substantial evidence. Separate from direct infringement under 35 U.S.C. § 271(a), a party's acts in connection with sale of equipment may constitute active inducement of infringement under § 271(b). *See Joy Technologies, Inc. v. Flakt, Inc.*, 6 F.3d 770, 774 (Fed. Cir. 1993). "Proof of actual intent to cause the acts which constitute infringement is a necessary prerequisite to finding active inducement." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469 (Fed. Cir. 1990). In addition, liability for active inducement is dependent on and "cannot occur without an act of direct infringement." *Joy Technologies*, 6 F.3d at 774.

One cannot infringe without notice of infringement. Fonar concedes that GE is not liable for direct infringement on MRI sales occurring before September 1992, the date when Fonar gave GE notice of infringement. Fonar seeks lost profit damages, however, for sales made prior to September 1992 on the theory that GE's service and repair after September 1992, of scanners sold prior to September 1992, constitutes active inducement. Even though the Court did not charge the jury on active inducement, it asked the jury to determine damages for active inducement. The jury awarded $13,625,000.

Fonar asserts that its active inducement theory finds support in *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 485 (1963), wherein the Su-

preme Court instructed that "[w]here use infringes, repair does also, for it perpetuates the infringing use." As the quoted language implies, however, and as the law of active inducement clearly states, there must be an underlying act of direct infringement before there can be an act of inducement of infringement. Indeed, the Supreme Court's next sentence leaves little room for doubt. It explained: " 'a patented article may be repaired without making the repairer an infringer[] . . . . where the device in patented form has come lawfully into the hands of the person for whom it is repaired.' " *Id.* (quoting *Union Special Mach. Co. v. Maimin*, 161 F. 748, 750 (C.C.E.D. Pa.), *aff'd*, 165 F. 440 (C.A. 3d Cir 1908)). GE was not liable for direct infringement on sales occurring prior to September 1992. With no underlying direct infringement as to those scanners, there can be no active inducement.

In retrospect, the jury should not have received an interrogatory on active inducement. The interrogatory was given at Fonar's request and over GE's objection. Having reviewed the law, however, the Court is convinced that Fonar's theory has no basis. Nevertheless, even if it did, no reasonable jury could have concluded that Fonar proved GE's actual intent to induce infringement. As such, the Court must disregard the jury's answer to question 5 on Special Verdict Sheet #2.

E. *Damages*

A patentee can recover damages for infringement, pursuant to 35 U.S.C. § 284, under two theories: lost profits and reasonable royalty. *See Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1544 (Fed. Cir. 1995) (en banc). Lost profits are available where the record permits an accurate determination of the patentee's loss of sales and profits because of the infringement. Reasonable royalties are always available. An award may be split between lost profits, as actual damages to the extent they are proved, and reasonable royalties for the remainder. *State Indus.*,

Inc. v. Mor-Flo Indus., Inc., 883 F.2d 1573, 1577 (Fed. Cir. 1989), *cert. denied*, 493 U.S. 1022 (1990). Determining the nature and amount of damages is a question of fact on which the patentee has the burden of proof. *BIC Leisure Prods. v. Windsurfing Int'l*, 1 F.3d 1214, 1217 (Fed. Cir. 1993).

1. *Lost Profits*

GE moves the Court to disregard the jury's finding of $27,825,000 in lost profits, based on 75 "lost" sales, as not supported by substantial evidence. Fonar contends that there is evidence in the record upon which a reasonable jury could base such a conclusion.

In order to recover lost profits, "the patentee must show a reasonable probability that, 'but for' the infringement, it would have made the sales that were made by the infringer." *Rite-Hite*, 56 F.3d at 1545 (quoting *Del Mar Avionics, Inc. v. Quinton Instrument Co.*, 836 F.2d 1320, 1326 (Fed. Cir. 1987)). The patentee must prove its claim to lost profits by a preponderance of the evidence. *Yarway Corp. v. Eur-Control USA, Inc.*, 775 F.2d 268, 275 (Fed. Cir. 1985). This burden includes the presentation of proper evidence for the computation of the lost profits. *Standard Havens Prods. v. Gencor Industs.*, 953 F.2d 1360, 1372 (Fed. Cir. 1991) (citing *King Instrument Corp. v. Otari Corp.*, 767 F.2d 853, 863 (Fed. Cir. 1985), *cert. denied*, 475 U.S. 1016 (1986)), *cert. denied*, 113 S. Ct 60 (1992).

Because the determination of damages "is not an exact science, . . . 'the amount need not be proven with unerring precision.'" *Del Mar Avionics, Inc. v. Quinton Instrument Co.*, 836 F.2d 1320, 1327 (Fed. Cir. 1987) (quoting *Bio-Rad Labs., Inc. v. Nicolet Instrument Corp.*, 739 F.2d 604, 616 (Fed. Cir.), *cert. denied*, 469 U.S. 1038 (1984)). In addition, "[w]hen the amount of the damages cannot be ascertained with precision, all doubts are resolved against the infringer." *Id.*

A useful test for determining whether a patentee met the "but for" requirement was enunciated in *Panduit Corp. v. Stahlin Bros.*, 575 F.2d 1152 (6th Cir. 1978). This test requires the patentee to establish the following four factors: (1) demand for the patented product; (2) an absence of acceptable noninfringing substitutes; (3) the patentee's ability to exploit the demand; and (4) the amount of profits the patentee would have made. *Id.* at 1156. The patentee's burden, however, is to prove no more than a reasonable possibility that the sales would have been made; the patentee need not negate "every possibility" that the purchaser might have bought another noninfringing product. *Rite-Hite*, 56 F.3d at 1545. The Court determined that it was unnecessary to charge the jury on the *Panduit* test.

According to the cross-examination testimony of Jay D. Miller ("Miller"), whom GE employs as the Americas Marketing Manager for MRI systems, Fonar and GE directly competed in the market for MRI scanners with magnetic field strengths of .3 to .5 Tesla. Trial Tr. at 2189. In that particular market, Miller testified that GE sold 21 Vectra scanners and "about" 50 Spectra scanners after September 1992. *Id.* Fonar acknowledges there were at least four other manufacturers competing in the market. *Id.* at 2116. The testimony of economics expert Laurits Christensen ("Christensen") indicated, however, that Fonar considered all manufacturers in the market to be infringers of the '966 patent and, therefore, considered every sale in the market to be a lost sale. *Id.*

Fonar presented evidence that it would have been able to meet demand for scanners equipped with MAO. Damadian testified that on the average Fonar could manufacture three scanners a month, and that, in 1988, at its peak rate of production, it was capable of manufacturing eight per month. *Id.* at 2049. Taking into account the corporation's growth rate, he added that Fonar would have been able in 1992 to manufacture 500 MRI scanners a year. *Id.* at 2050.

Viewing the record as a whole and drawing all inferences in favor of Fonar, the Court determines that there is substantial evidence supporting the jury's conclusion that Fonar had reasonable possibility of selling 75 scanners but for GE's infringement. GE's motion is denied in this respect. Because the record also supports the jury's determination as to the amount of lost profit damage, the Court denies GE's request to reduce the amount of the award.

2. *Reasonable Royalties*

Where, as in the instant case, there is no established royalty between the parties, a reasonable royalty should be based upon "the supposed result of hypothetical negotiations between the plaintiff and defendant." *Rite-Hite*, 56 F.3d at 1554. "The hypothetical negotiation requires the [jury] to envision the terms of a licensing agreement reached . . . at the time of infringement." *Id.* A defendant challenging a jury's determination, must show that, in view of all the evidence, the award is " 'so outrageously high . . . as to be unsupportable as an estimation of a reasonable royalty.' " *Id.* (quoting *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 895 F.2d 1403, 1406 (Fed. Cir. 1990)).

After awarding Fonar lost profits on 75 of the 600 infringing scanner sales, the jury added $34,125,000 as a reasonable royalty on the remaining 525 infringing units. GE contends that the award is outrageously high. Fonar supports the award as reasonable in light of the evidence, particularly the testimony of Christensen.

Christensen testified that a reasonable royalty could be a percentage of GE's total revenues from the sales of infringing scanners. Trial Tr. at 2079. Christensen stated that a known "rule of thumb" for determining an appropriate royalty rate was one-quarter to one-third of anticipated profits on the sale of infringing scanners. *Id.* Christensen then stated that, according to GE's records,

GE earned a 25 percent operating profit on infringing sales. *Id.* at 2079-80. Given that, he determined that 7.25 percent—"the midpoint"—would be a reasonable royalty rate. *Id.* at 2080. Christensen then calculated a $54 million reasonable royalty for the 525 infringing sales.

Raymond S. Sims ("Sims"), an economist, and George R. Clark ("Clark"), a patent licensing specialist, testified on GE's behalf. Sims indicated that a reasonable royalty would be between $1,000 and $3,500 per unit. *Id.* at 2214-19. Clark indicated that $1,000 per unit would be appropriate. *Id.* at 2285. The decisive factor underlying both experts' conclusions was Fonar's acknowledgment that it had sold MAO as a separate and distinct MRI feature for $1,000 to $1,500, and as part of an upgrade package worth $15,000. GE, therefore, suggests that a reasonable royalty on the remaining 525 infringing sales would be in the $525,000 to $1,837,500 range.

The gap between the experts' evaluations raises the issue of whether Fonar is entitled to a royalty based on the entire value of an MRI scanner, or merely the value of MAO as but one feature of the scanner. Under the "entire market value" rule, damages are recoverable on the value a patentee's entire apparatus containing several unpatented features where "the patent-related feature is the 'basis for customer demand.'" *Rite-Hite*, 56 F.3d at 1549-50 (quoting *State Indus.*, 883 F.2d at 1580)). Where the patented and unpatented components of the device are physically part of the same machine, the patentee can typically recover compensation based on the value of the entire apparatus. *See id.* (citing *Western Elec. Co. v. Stewart-Wagner Corp.*, 631 F.2d 333 (4th Cir. 1980), *cert. denied*, 450 U.S. 971 (1981)). Nonetheless, the Court instructed the jury that it could "consider whether it is appropriate to base compensation on the entire apparatus normally anticipated to be sold, even though only one feature is patented." Trial Tr. at 2448. The size of the jury's reasonable royalty award indicates that it chose

not to accept GE's theory of valuation. Based on *Rite-Hite,* that choice was a reasonable one.

The jury was also instructed that, in determining a reasonable royalty, it should consider "how much profit or cost savings the infringer expected to realize from his practice of the [patented] invention" at the time of infringement. *Id.* at 2449-50. Miller, GE's MRI marketing specialist, testified on direct examination as to the decline in demand for MAO since 1992. He stated that "[t]hese days, multi-slice multi-angle is not as an important feature as it was at one time." *Id.* at 2168. He explained that "before 1992, ... [y]ou wanted to image as many patients per day as possible and there was actually a waiting list of patients to come in and scan if you had an extra hour or two per day." *Id.* at 2169. Miller's testimony indicates, quite clearly, that demand for MAO was high at the time when "hypothetical negotiations" would have taken place. Based on the testimony of its own marketing expert, the jury could have reasonably concluded that GE would have paid a royalty reflecting the high demand for MAO at the time of infringement.

The Court determines that substantial evidence supports the reasonableness of the jury's royalty award. GE's motion is denied in this regard. For the same reason, the Court denies GE's request for remittitur.

3. *Injunction*

Based on the foregoing, GE and South Shore and their officers, agents, servants, and employees, and those persons in active concert or participation with them, are restrained and enjoined, from and after the date of this Memorandum & Order and until the expiration of the '966 patent or the date upon which any court enters an order (1) vacating the jury's finding of infringement of the claims of the '966 patent or (2) finding the claims of the '966 patent invalid, from infringing, directly, indirectly, contributorily, or by inducement, the '966 patent by making, using, or

selling, or causing to be made, used, or sold any MRI scanners.

Further, GE and South Shore and their officers, agents, servants, and employees, and those persons in active concert or participation with them, are restrained and enjoined from and after the date of this Memorandum & Order and until the expiration of the '966 patent or the date upon which any court enters an order (1) vacating the jury's finding of infringement of the '966 patent or (2) finding the claims of the '966 patent invalid from infringing, directly, indirectly, contributorily, or by inducement, the '966 patent by making, using, or selling, or causing to be made, used, or sold any upgrade of software and/or hardware to any MRI scanner that would give such MRI scanner the capability of obtaining in the course of a single scan NMR image data from a plurality of differently oriented selected planes in an object using magnetic resonance techniques in accordance with the claims of the '966 patent.

Nothing in this order shall preclude GE or South Shore and their officers, agents, servants, and employees, and those persons in active concert or participation with them from using, servicing, or upgrading in any manner whatsoever any MRI scanner delivered by GE before May 26, 1995, and such using, servicing, or upgrading shall not create additional liability under the '966 patent.

4. *Interest*

Under 35 U.S.C. § 284, a judgment may be accompanied by "interest and costs as fixed by the court." The Supreme Court has stated that "prejudgment interest should be awarded under § 284 absent some justification for withholding such an award." *General Motors Corp. v. Devex Corp.*, 461 U.S. 648, 657 (1983). Prejudgment interest serves to compensate the patentee because, in addition to lost profits and royalties payments, he also lost the use of that money between the time of infringement

and the date of judgment. *Id.* A court has substantial discretion to determine the interest rate in patent cases. *Gyromat Corp. v. Champion Spark Plugs Corp.*, 735 F.2d 549, 556-57 (Fed. Cir. 1984).

The parties each presented intricate arguments, supported by detailed expert affidavits, and somehow reached starkly different results. The Court finds that the record lacks support for many of the contentions advanced.

The Court determines that fair and adequate compensation includes an award of prejudgment interest. The rate of interest should be based on the average 52-week United States Treasury bill rate for the period of September 1992 to the date of this Memorandum & Order. Prejudgment interest shall be computed daily and compounded annually.

III. CONCLUSION

For the above reasons, GE's motion is granted in part and denied in part. The motion is granted insofar as it seeks entry of JMOL in favor of GE on grounds that it did not directly infringe the '832 patent and did not induce infringement of the '966 patent. The balance of the motion for JMOL, like GE's motion for a new trial, is denied in all respects. Insofar as this Memorandum & Order grants injunctive relief, however, it is stayed pending appeal, subject to a bond.

Counts II, IV, V, VI, VII, and VIII of the complaint having been withdrawn, and the Hitachi defendants having been released from this action, the Clerk of the Court is directed to enter judgment consistent with this Memorandum & Order and as follows:

(1) as to Court I of the complaint, defendants GE and South Shore have not directly infringed or induced infringement of Claims 1 and 2 of the United States Patent No. 3,789,832;

(2) defendants GE and South Shore have failed to establish any of their defenses as to United States Patent No. 3,789,832;

(3) Count I of the Complaint is dismissed;

(4) as to Count III of the complaint defendants GE and South Shore, by jury verdict, have directly infringed Claims 1, 2, 4, 5, and 12 of the United States Patent No. 4,871,966;

(5) as to Count III of the complaint, defendant GE has not induced infringement of Claims 1, 2, 4, 5, and 12 of United States Patent No. 4,871,966;

(6) defendants GE and South Shore have failed to establish any of their defenses as to United States Patent No. 4,871,966; and

(7) as to Count III of the complaint, by jury verdict, plaintiffs Fonar and Raymond V. Damadian are awarded and defendants GE and South Shore must pay a sum of $61,950,000, plus prejudgment interest as set forth above.

SO ORDERED.

/s/ Leonard D. Wexler
LEONARD D. WEXLER
United States District Judge

Dated: Hauppauge, New York
September 30, 1995

APPENDIX

The claims of the '966 patent are as follows:

1. A method for obtaining in the course of a single scan NMR image date for a plurality of differently oriented selected planes in an object using nuclear magnetic resonance techniques, said method comprising the steps of:

(a) positioning an object in a static homogeneous magnetic field;

(b) determining first and second selected planes in said object for which NMR image data is to be obtained, said first selected plane being located at a first portion of said object and having a first orientation with respect to a predetermined direction and said second selected plane being located at a second portion of said object and having a second orientation with respect to said predetermined direction, said first and second orientations being different from one another;

(c) subjecting said object to a plurality of repetitions of a first repetition sequence composed of NMR excitation and magnetic gradient field pulses, each of said repetitions of said first repetion sequence including the steps of applying an excitation pulse and reading out of an NMR signal produced by said excitation pulse, said excitation pulse for said first repetition sequence being applied at a first predetermined frequency in the presence of a first predetermined slice selector magnetic field gradient having a gradient direction extending perpendicular to said first selected plane, said first predetermined frequency being chosen to that said application of said excitation pulse at said first predetermined frequency only excites selected nuclei in said first selected plane, and said plurality of repetitions of said first repetition sequence being car-

ried out in a manner to encode spatial information into a first collection of said NMR signals, said first collection of NMR signals being representative of NMR image data for said first selected plane; and

(d) subjecting said object to a plurality of repetitions of a second repetition sequence composed of NMR excitation and magnetic field gradient pulses, each of said repetitions of said second repetition sequence including the steps of applying an excitation pulse and reading out of an NMR signal produced, by said excitation pulse, said excitation pulse for said second repetition sequence being applied at a second predetermined frequency in the presence of a second predetermined slice selector magnetic field gradient having a gradient direction extending perpendicular to said second selected plane, said second predetermined frequency being chosen so that said application of said excitation pulse at said second predetermined frequency only excites selected nuclei in said second selected plane, and said second predetermined slice selector magnetic field gradient and said second predetermined frequency being different from said first predetermined slice selector magnetic field gradient and said first predetermined frequency, respectively, and said plurality of repetitions of said second repetition sequence being carried out in a manner to encode spatial information into a second collection of NMR signals, said second collection of NMR signals being representative of NMR image data for said second selected plane;

said plurality of repetitions of said first and second repetition sequences each being carried out during the course of a single scan of said object and each being continued substantially through-

out said single scan, the repetition time interval for repeating each of said first and second repetition sequences being substantially the same and said steps of applying an excitation pulse and reading out of an NMR signal for each repetition of said second repetition sequence being performed at a different time during said repetition time interval than each of said steps of applying an excitation pulse and reading out of an NMR signal for said first repetition sequence.

2. The method of claim 1, wherein step (c) comprises generating said magnetic gradient field pulses of said first repetition sequence via a first and a second wave-form, corresponding to said first orientation of said first selected plane, which produce said first predetermined slice selector magnetic field gradient, and a first predetermined read out magnetic field gradient having a direction orthogonal to that of said first predetermined slice selector magnetic field gradient; and

wherein step (d) comprises generating said magnetic field gradient pulses of said second repetition sequence via a third and a fourth waveform, corresponding to said second orientation of said second plane, which produce said second predetermined slice selector magnetic field gradient, and a second predetermined read out magnetic field gradient having a direction orthogonal to that of said second predetermined slice selector magnetic field gradient.

4. A method for conducting an examination of an object along two different selected planes using nuclear magnetic resonance techniques, said method comprising the steps of:

(a) positioning an object in an NMR imaging apparatus which includes means for generating a magnetic field, means for exciting selected nuclei to generate NMR signals and for reading of such NMR signals

to provide a collection of NMR signals from selected regions of an object placed in said NMR imaging apparatus, means for applying gradient magnetic fields, means for obtaining NMR imaging date from said collection of NMR signals and means for producing an image from said NMR imaging date;

(b) operating said NMR imaging apparatus to obtain an NMR scout image for a portion of said object of said examination:

(c) while said object remains positioned in said NMR imaging apparatus, using said scout image to select a first plane and a second plane of said object for which NMR image data is to be obtained, said first plane and said second plane each being transverse to said scout plane, and said first plane having a first orientation relative to said scout plane and said second plane having a second orientation relative to said scout plane, said first orientation being different from said second orientation;

(d) conducting a plurality of NMR sampling operations to obtain NMR imaging date from said first selected plane of said object, said step of conducting said sampling operations for said first plane being commenced at a first time during the course of a single scan and being continued substantially throughout said single scan so as to obtain NMR imaging date for said first-selected plane of said object;

(e) conducting a plurality of NMR sampling operations to obtain NMR imaging data from said second selected plane of said object which is different from said first selected plane, said step of conducting said sampling operations for said second selected plane being commenced at a second time during the course of said single scan which is later than said first time, but prior

to completion of said step of conducting said sampling operations for said first selected plane, and said step of conducting said NMR sampling operations for said second selected plane being continued substantially throughout said single scan to obtain NMR imaging data for said second selected plane; each of said plurality of NMR sampling operations including an NMR excitation operation and an NMR reading operation, said NMR excitation operations for each of said selected planes being carried out in a manner so as to excite selected nuclei in said each of said selected planes, and said NMR imaging data, each of said NMR excitation and NMR reading operations being performed at a different time during the course of said single scan than each other of said excitation and reading operations.

5. The method of claim 4, wherein step (d) comprises applying a first and a second waveform, corresponding to said first orientation of said first plane, to said means for applying gradient magnetic fields, to produce a first predetermined slice selector magnetic field gradient having a direction orthogonal to said first plane, and wherein;

step (e) comprises applying a third and a fourth waveform, corresponding to said second orientation of said second plane, to said means for applying gradient magnetic fields, to produce a second predetermined slice selector magnetic field gradient having a direction orthogonal to said second plane.

12. Apparatus for obtaining NMR image data from a plurality of selected planes in an object comprising:

(a) means for applying magnetic fields to the object;

(b) means for applying radio frequency excitation pulses to the object;

(c) means for actuating and controlling said magnetic field applying means and said radio frequency applying means to:

(1) apply a first sequence including a first slice selector magnetic field gradient in a first direction concomitantly with a first RF excitation pulse at a first frequency to thereby excite nucleii only in a first plane perpendicular to said first direction, whereby a first NMR signal will be emitted only by nucleii in said first plane, said first sequence further including at least one encoding magnetic field gradient operative to encode spatial information into said NMR signal;

(2) apply a second sequence including a second slice selector magnetic field gradient in a second direction different from said first direction concomitantly with a second RF excitation pulse at a second frequency different from said first frequency to thereby excite nucleii only in a second plane perpendicular to said second direction whereby a second NMR signal will be emitted only by nucleii in said second plane, said second sequence further including at least one encoding magnetic field gradient operative to encode spatial information into said second NMR signal; and

(3) a repeat said first and second sequences a plurality of times during the course of a single scan so as to excite nucleii in said first and second planes alternatively and produce said first and second NMR signals alternately while varying said at least one encoding gradient in each said sequence on each repetition; and

(d) means for receiving said first and second NMR signals and recovering NMR image data therefrom.

[Filed Nov. 17, 1995]

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

92-CV-4196 (LDW)

FONAR CORPORATION, a Delaware Corporation, and DR. RAYMOND V. DAMADIAN, an individual,
Plaintiffs,

-against-

HITACHI LTD., a Japanese Corporation; HITACHI MEDICAL CORPORATION OF JAPAN, a Japanese Corporation; HITACHI MEDICAL SYSTEMS AMERICA, INC., a Delaware Corporation; SUMMIT WORLD TRADE CORPORATION, a Delaware Corporation; HITACHI MEDICAL CORPORATION OF AMERICA, a Delaware Corporation, GENERAL ELECTRIC CORPORATION, a New York Corporation, BROOKHAVEN MAGNETIC RESONANCE IMAGING, INC., a New York Corporation, and DRUCKER & GENUTH, MDS, P.C., D/B/A SOUTH SHORE IMAGING ASSOCIATES, a New York Corporation,
Defendants.

JUDGMENT

Fonar Corporation and its founder Dr. Raymond V. Damadian ("Damadian") (collectively, "Fonar") brought the above-referenced patent infringement action, by summons and complaint dated September 1, 1992, against General Electric Corporation and Drucker & Genuth, MDs, P.C., d/b/a South Shore Imaging Associates ("South Shore") (collectively, "GE"), and against Hitachi LTD, Hitachi Medical Corporation, Hitachi Medical Systems America, Inc., Summit World Trade Corporation, Hitachi Medical Corporation of America, and Brookhaven

Magnetic Resonance Imaging, Inc. (the "Hitachi defendants"). Upon settlement of the claims asserted against them, the Hitachi defendants were released from the action prior to trial, pursuant to Stipulation and Order of Dismissal with prejudice dated May 18, 1995. On May 19, 1995, after a thirteen-day trial on liability, a jury returned a verdict in favor of plaintiffs wherein it found that the two patents in suit were not invalid and infringed. On May 26, 1995, after hearing three days of testimony on damages, the same jury awarded plaintiffs $110,575,000. Thereafter GE filed a motion, pursuant to Fed. R. Civ. P. 50 and 59, for judgment as a matter of law ("JMOL") and, in the alternative, for a new trial. A Memorandum and Order of Hon. Leonard D. Wexler, United States District Judge, filed on October 06, 1995, granted in part and denied in part GE's motion. The motion is granted insofar as it seeks entry of JMOL in favor of GE on grounds that it did not directly infringe the '832 patent and did not induce infringement of the '966 patent. The balance of the motion for JMOL, like GE's motion for a new trial, is denied in all respects. Insofar as the Order of this Court grants injunctive relief, however, it is stayed pending appeal, subject to a bond.

Counts II, IV, V, VI, VII, and VIII of the complaint having been withdrawn, and the Hitachi defendants having been released from this action, and the Clerk of the Court having been directed to enter judgment consistent with the Memorandum and Order filed on October 06, 1995, it is

ORDERED and ADJUDGED that:

(1) as to Count I of the complaint, defendants GE and South Shore have not directly infringed or induced infringement of Claims 1 and 2 of the United States Patent No. 3,789,832;

(2) defendants GE and South Shore have failed to establish any of their defenses as to United States Patent No. 3,789,832;

(3) Count I of the Complaint is dismissed;

(4) as to Count III of the complaint defendant GE, by jury verdict, has directly infringed Claims 1, 2, 4, 5, and 12 of United States Patent No. 4,871,966;

(5) as to Count III of the complaint, defendant GE has not induced infringement of Claims 1, 2, 4, 5, and 12 of United States Patent No. 4,871,966;

(6) defendant GE has failed to establish any of their defenses as to United States Patent No. 4,871,966; and

(7) as to Count III of the complaint, by jury verdict, plaintiffs Fonar and Raymond V. Damadian are awarded and defendant GE must pay a sum of $61,950.00 plus prejudgment interest to be computed daily and compounded annually, and with monthly royalty payments, based on the average 52-week United States Treasury bill rate from September 1992 through the date of entry of judgment (November 17, 1995) for the total interest in the sum of $6,471,726.00 for a total judgment sum of $68,421,726.00.

Dated: Hauppauge, New York
November 17, 1995

ROBERT C. HEINEMANN
Clerk of the Court

By: /s/ Joseph Di Talia
JOSEPH DI TALIA
Deputy Clerk-in-Charge

Approved:

/s/ Leonard D. Wexler
LEONARD D. WEXLER
United States District Judge

[Filed May 8, 1997]

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

96-1075, -1106, -1091

FONAR CORPORATION and
DR. RAYMOND V. DAMADIAN,
Plaintiffs/Cross-Appellants,

v.

GENERAL ELECTRIC COMPANY,
and DRUCKER & GENUTH, MDS, P.C.,
d/b/a SOUTH SHORE IMAGING ASSOCIATES,
Defendants-Appellants.

ORDER

A combined petition for rehearing and suggestion for rehearing in banc having been filed by the APPELLANT, and a response thereto having been invited by the court and filed by the CROSS-APPELLANT, and the petition for rehearing having been referred to the panel that heard the appeal, and thereafter the suggestion for rehearing in banc and response having been referred to the circuit judges who are in regular active service,

UPON CONSIDERATION THEREOF, it is

ORDERED that the petition for rehearing be, and the same hereby is, DENIED and it is further

ORDERED that the suggestion for rehearing in banc be, and the same hereby is, DECLINED.

The mandate of the court will issue on May 15, 1997.

Circuit Judge SCHALL and Circuit Judge RICH did not participate in the vote.

FOR THE COURT
JAN HORBALY
Clerk

Dated: May 8, 1997

By /s/ Brian P. LeDuc
BRIAN P. LEDUC
Associate Chief Deputy Clerk